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MICA INSULATION.

At the time the Standardization Rules of the American Institute of Electrical Engineers underwent such a thorough revision a few years ago there was considerable discussion as to the proper allowable maximum temperature for those insulating materials which were designated as constituting Class B. This class consists of mica, asbestos and other materials capable of resisting high temperatures, in which a binder of such material as cotton, silk and paper is used for structural purposes only and may be destroyed without impairing the insulating or mechanical qualities of the insulation. Although manufacturers and many others were aware of the fact that mica was already being subjected to temperatures higher than 125 degrees centigrade without damage to the machinery, this temperature was nevertheless selected as the maximum temperature to which material of this kind may be subjected and the rules specify that the capacity of electrical machinery is to be determined upon this basis. The figure chosen was of course very conservative, but was finally selected to satisfy those who were not aware of what has already been accomplished in the use of mica at higher operating temperatures. Unfortunately sufficient data actually obtained under operating conditions were not at the time available to constitute a decisive argument on this point.

The paper presented by Mr. F. D. Newbury at the meeting of the American Institute of Electrical Engineers last week supplies experimental evidence of the kind desired, and, in the opinion of most of those familiar with the matter, gave sufficient justification for immediate change of the figure in the Standardization Rules to 150 degrees if not higher. The experiments described by Mr. Newbury resulted in the actual measurement of operating temperatures over 200 degrees in a machine which has been in steady service for 20 years, and in which the insulation is still in good operating condition. The fact that operation has frequently been carried out with loads greater than those utilized during the test shows that still higher temperatures than those measured may have been experienced at certain times, and, according to Mr. Newbury, these have probably exceeded 250 degrees. This machine is not of modern design and the operating voltage is only 2,300 volts. It does not follow that such operating temperatures would be safe in all types of machine and it is generally agreed that it would not be safe to raise the permissible temperatures above 200 degrees centigrade. As to what would be the best limiting temper-

ature to adopt in the range between 125 and 200 degrees is a matter of opinion and perhaps more evidence will be necessary to definitely determine this point. There seems little doubt, however, that no danger will be involved in permitting operating temperatures of from 150 to 180 degrees.

Those who have not been familiarly acquainted with the design and operation of electrical machinery under modern conditions may not be ready to adopt a step which at first may appear somewhat radical, but those to whom information has been available have long realized not only that mica may be safely exposed to higher temperatures than those specified in the past but that it has actually been so exposed in machinery long in successful operation. The actual temperatures attained have not been definitely known, and even those most intimate with this subject have been somewhat in the dark as to exactly what has been going on. Additional observational data along these lines will be very welcome to the industry.

THE CONFERENCE ON VALUATION.

The Utilities Bureau which was endorsed by the conference of mayors held in Philadelphia about a year ago has been definitely launched and a conference on the valuation of utilities which was called by it took place last week in Philadelphia and is reported elsewhere in this issue. The desire was expressed at this conference that such gatherings be made an annual event and it seems probable that this desire will be carried out.

This year's conference was valuable in bringing together a large number of those who have been devoting a great deal of attention to matters connected with the regulation of utilities. Among the number were members of public service commissions, representatives of a few utility companies, rate experts, etc. Most of the opinion expressed in the various sessions was from the standpoint of those who claim to represent the interests of the public as opposed to the interests of utility corporations. Nevertheless, in most cases both sides of the debatable points at issue were brought out and authorities of various kinds were cited for the different points of view. It was evident that the subject is still in a somewhat chaotic state.

One of the principal questions at issue was as to whether the return permitted to a utility company should be based upon reproductive cost or original cost. So far as equity between investor and consumer is concerned, original cost would seem to be the fairest basis. In many cases, however, original cost cannot be determined and recourse is necessarily had to the cost of reproducing the property. Many court decisions have approved of this method and it has even been specifically required by certain statutes. In most cases this method of appraisal will result in a higher valuation than one based upon original cost, since the present is a time of high prices for both material and labor. At the present time such a policy therefore redounds to the benefit of the utility companies, but it should be kept in mind that under conditions which may obtain in the future the method might be correspondingly prejudicial to their interests.

A determination of rate questions upon the basis of actual investment in the property might therefore seem to be the fairest and also the safest basis for safeguarding the interests of both investors and the public in the long run. In cases where the question of confiscation is to be decided by the federal courts, previous decisions would indicate that the actual present value of the property would have to be given main consideration, but in determining fair values for rate-making, suitable legislation might require commissions and local courts to give principal weight to the actual investment, as is already done in Massachusetts.

INTANGIBLE VALUES.

Probably more disputes arise in the valuation of public utility properties for rate-making purposes over intangible values than over any other debatable element. Of the elements of intangible value those representing a legitimate actual outlay, as for organization expenses, are generally accepted as proper and allowable. Other items, such as franchise value, going value and early losses, are frequently bones of contention for which no definite rules have as yet been developed for general application. Certain elements are said to have value in connection with appraisals for purchase or condemnation, while not having value which should be considered in connection with rate-making. Values which result from the capitalization of present earning power are usually placed in this class. It is claimed that such values would not exist if the regulatory power had been previously used to establish reasonable rates, and if such values are recognized no rate already in existence, however high, can be deemed unreasonable except possibly with respect to its relation to other rates. To destroy any part of the present income by reducing rates will destroy the intangible value represented by capitalized earning power.

With respect to the value of a going concern as distinct from that of the physical property alone, opponents of this allowance claim that an ordinary appraisal is made from the standpoint of a going concern and that otherwise the physical property would have only scrap value. The decision of the Supreme Court of the United States in the Des Moines gas case is pointed to as an endorsement of this idea by that tribunal. However, this and other cases coming before the highest court which have involved this question in any way, have not brought forth an opinion which has elucidated this point in such a manner as to place it beyond dispute, and it will probably be necessary to take other cases involving the point to the Supreme Court before a general rule is recognized. It should be remembered, however, in this connection, that the rulings of the federal courts are usually made from the standpoint of infringement of rights which are

guaranteed by the fourteenth amendment of the constitution of the United States. The courts merely decide how far regulating commissions may go without confiscation. The rules which they lay down in these cases are not to be considered decisive in determining what elements of value should be allowed in fixing reasonable rates.

The question of franchise value has never been clearly settled by the Supreme Court, but it is probable that this will be done in a case now pending which has been appealed to it by the Public Service Company, involving the rate for gas in Passaic, N. J. The points involved in this case have already been discussed in these columns upon several occasions.

THE PHILADELPHIA ELECTRIFICATION.

A description is given in this issue of the electrification of the main line of the Pennsylvania Railroad, between Philadelphia and Paoli. Electric power is used only for suburban passenger service, and its adoption was dictated principally by the congestion at the Broad Street terminal. This growing demand for trackage and switching in the station approaches has partly been met by dispatching trains through from New York to Pittsburgh and Washington, without entering the main station at Philadelphia, but continual growth of traffic demanded further relief. The adoption of electrification for suburban trains adds to the train capacity of the terminal, and equipment of the Chestnut Hill and other suburban lines will follow the initial installation.

Electric operation has been going on for some months and has given great satisfaction. The single-phase system was chosen, not primarily on account of its suitability to the work in hand, but with regard to the extension of electrification to through traffic, which will no doubt take place on this system at some time in the future.

Two features are especially to be noted in connection with this electrification. One is the purchase of electric energy from the local central station. The Philadelphia Electric Company, after a study of the proposition, found itself enabled to offer a rate for this supply which would be advantageous to both purchaser and central station. The railroad is thus relieved of both investment and care required for it to operate a separate power house of its own. Single-phase current is delivered to the railroad at 13,200 volts and stepped up to 44,000 volts for transmission to the substations. At the substations the voltage is stepped down to 11,000 volts and supplied to the cars at this pressure. The substations are operated without attendants, and this is another feature of interest, but one to be expected where there is no rotating apparatus in operation.

Separate supply of current is supplied for signal lamps, so that failure of the motive supply will not interfere with steam operation. This is especially desirable for a case of mixed operation.

NOBEL PRIZES AWARDED TO AMERICA.

The first press dispatches stating that the Nobel prize in physics for the year 1915 has been awarded to two American investigators has been confirmed by the official announcement. The award has been made to Thomas A. Edison and Nikola Tesla, both of whom are best known for their inventions in the practical electrical field. The work of both, however, has had an important bearing upon the more theoretical and physical aspects of electrical science, and it is gratifying to find two practical American men of genius carrying off the award in a scientific field.

The recognition of the researches of these inventors comes rather late but is none the less welcome. The work upon which the reputation of each is principally based was done many years ago, but in making the Nobel awards, consideration is given not merely to the attainments of those under consideration during the past year, but to the total accomplishments of their entire lives.

Dr. Edison's name is probably best known in connection with the incandescent lamp, the phonograph and the storage battery, but his investigations have covered a much wider field and even the inclusion of his telegraph inventions and other technical applications does not exhaust the field of his accomplishment. A number of principles which are of importance in physics were first demonstrated by him and the variety and extent of his work are evidenced by the fact that he has received patents upon more than nine hundred inventions.

These include in their subject matter the carbon telephone transmitter, the kinetoscope and kinetophone, the microtasimeter, the aerophone, the mimeograph, and poured concrete houses. His work has been recognized in various ways. He is a Commander of the Legion of Honor and has been awarded the Rathenau and Adelskiold medals, as well as an honorary degree of doctor of philosophy.

Dr. Tesla similarly is best known from his practical work with the alternating-current motor and the production of high-frequency currents. The latter work, however, involved physical principles which had not previously been applied and he was the first, through the use of what is known as the Tesla transformer, to produce high voltages at exceedingly high frequencies. At the time this was first done they were of merely physical interest but developments since that time have added to the practical importance of this work. His more recent work with the reversible turbine and pump is also of scientific as well as practical interest.

The award in chemistry to Prof. Theodore W. Richards brings another deserved prize to this country. The work of Professor Richards at Harvard University is generally recognized as the most thorough and exhaustive in the study of atomic weights that has been done anywhere, and it is appropriate that it should receive this recognition.

Boston Section Discusses Meters.

At the November meeting of the Boston Section, American Institute of Electrical Engineers, held November 9, at the Engineers' Club, W. H. Pratt, of the General Electric Company, Lynn, Mass., described the construction of meters.

William Bradshaw, of the Westinghouse Electric & Manufacturing Company, Pittsburgh, showed a new prepayment device which is used in connection with a standard meter. Instead of a device which is set forward when the coin is inserted and which returns to "O" after the amount of energy has been used, this apparatus has two hands which coincide when the switch is open. When the coin is inserted and the device turned, one hand goes to the point representing the limit of the coin's value and the travel of this indicator shows the amount yet to be used.

In the discussion, the relative usefulness of diamonds and sapphires as meter bearings was touched upon. It was stated that the diamond is the superior where there is a heavy moving element, and is used mainly in meters of high capacity. The costs of these stones is about one dollar each, they being chips discarded in jewelry cutting. It was pointed out that a film of high quality oil adds to the life of meter bearings.

The next meeting of the Section will be held December 7. A plan is being perfected for a joint dinner of the electrical, mechanical and civil engineering societies of Boston in January.

Financier Says Utilities Are Big Money Savers.

Tribute was paid to public utility corporations as money savers to the people, government investigation of capital was decried and a bright future for the United States was predicted in an address by Thomas W. Andrew, cashier of the First National Bank, of Philadelphia, at the weekly luncheon of the Jovians at the Hotel Adelphia, Philadelphia. "The business outlook for the country is all right," he said, "and a man who is a bear on the United States will go broke." The speaker also intimated that the place of the Federal Reserve Bank in its relation to the general banking system of the country had not been fixed to the satisfaction of the national banks as a class. The speaker, after touching upon the money trust investigation, said that for a while the idea was abroad that anything that was big was iniquitous. "A year ago," Mr. Andrews said, "I remarked to a man who shared this idea that I wished all the public utilities, the street cars, telephone, gas, electric light and other companies would suddenly stop doing business. It would bring people to their senses and cause them to realize the great benefits received from the public utility concerns."

Illuminating Engineering Society.

At a meeting of the Council of the Illuminating Engineering Society, held November 11, it was announced that a special edition of the "Code on Lighting of Mills and Factories" would be published within a week. This edition is to be distributed to factory, mill, legislative, lighting and other authorities at a nominal price.

Hereafter the badge of associate members is to have a maroon field, while that of members will be blue.

C. A. Littlefield was appointed general secretary to succeed Alten S. Miller, resigned.

Further arrangements were made for the convention, which is to be held next February to mark the tenth anniversary of the organization of the Society. Plans for the proposed course of lectures, similar to that given at Johns Hopkins University in 1910 under the joint auspices of the University and the Society, were discussed but the place and definite dates were not set. It has been decided, however, that the course will be given early next fall, probably immediately following the annual convention which is usually held during the latter part of the month of September.

Lincoln Highway Association Holds Annual Meeting.

The annual meeting of the directors of the Lincoln Highway Association was held on November 10 at the offices of the national headquarters in Detroit, Mich., and important plans for the future development of the great national thoroughfare were formulated.

Officers for the coming year were elected as follows: Henry B. Joy, president; Carl G. Fisher, vice-president; Roy D. Chapin, vice-president; Emory W. Clark, treasurer, and Austin F. Bement, secretary.

Of highest interest among the plans for the coming year will be the building of as large a number as possible of seedling miles along the entire route.

Nobel Prize for Edison, Tesla and Richards.

To Prof. Theodore William Richards of Harvard University has been awarded the postponed 1914 Nobel chemistry prize for fixing the atomic weights of chemical elements, a Stockholm dispatch reports.

The 1914 prize for physics goes to Prof. Max von Laue of Frankfort-on-Main, for discovering the diffraction of X-rays in crystals.

The awards of the 1915 prizes have also been made as follows:

Physics—Thomas A. Edison, Nikola Tesla.

Chemistry—Prof. Theodor Svedberg.

Philadelphia Section Activities.

"Preparedness" on the part of the employee was the subject discussed at the opening meeting of the Philadelphia Electric Company Section, N. E. L. A., October 18, and a capacity attendance of over 500 members listened in close attention, as President Joseph B. McCall, in a forceful and interesting address, discussed the many important points incident to this timely subject.

Mr. McCall laid particular stress upon the educational work being done by the Philadelphia Electric Company and other large electrical companies throughout the country in assisting employees to qualify for advancement, and especially urged the younger men to take advantage of these opportunities if they hoped to qualify for the higher positions in the industry.

Vice-President Eglin followed with a brief address emphasizing the value of co-operation as manifested in the results at Station "A-2" and then awarded the prizes offered by Mr. McCall for the three best papers on "Economies in Operation or Management." The first prize of $50 in gold was awarded to N. E. Funk, of the Operating Department, for his paper on "Boiler-Room Efficiency;" the second and third prizes of $25 in gold each, to Frank T. Adams of the Underground Department and Harold Goodwin, Jr., of the Distribution Department. Mr. Adam's paper is entitled: "A Description of Underground Construction of Conduit and Cables for Electrical Purposes, with Suggestions on Economy"; and the title of Mr. Goodwin's paper is: "Single, Two, Three and Four-Phase Distribution."

The opening meeting of the Commercial Branch was held on Monday evening, October 25. Charles J. Russell, sales manager of the Philadelphia Electric Company, addressed the meeting on the subject of "Systematic Sales Effort." Mr. Russell's paper contained many valuable points.

The November meeting of the Engineering Department Branch was devoted to a discussion of the steam-flow meter. The speaker was John Bernard, of the Operating Department.

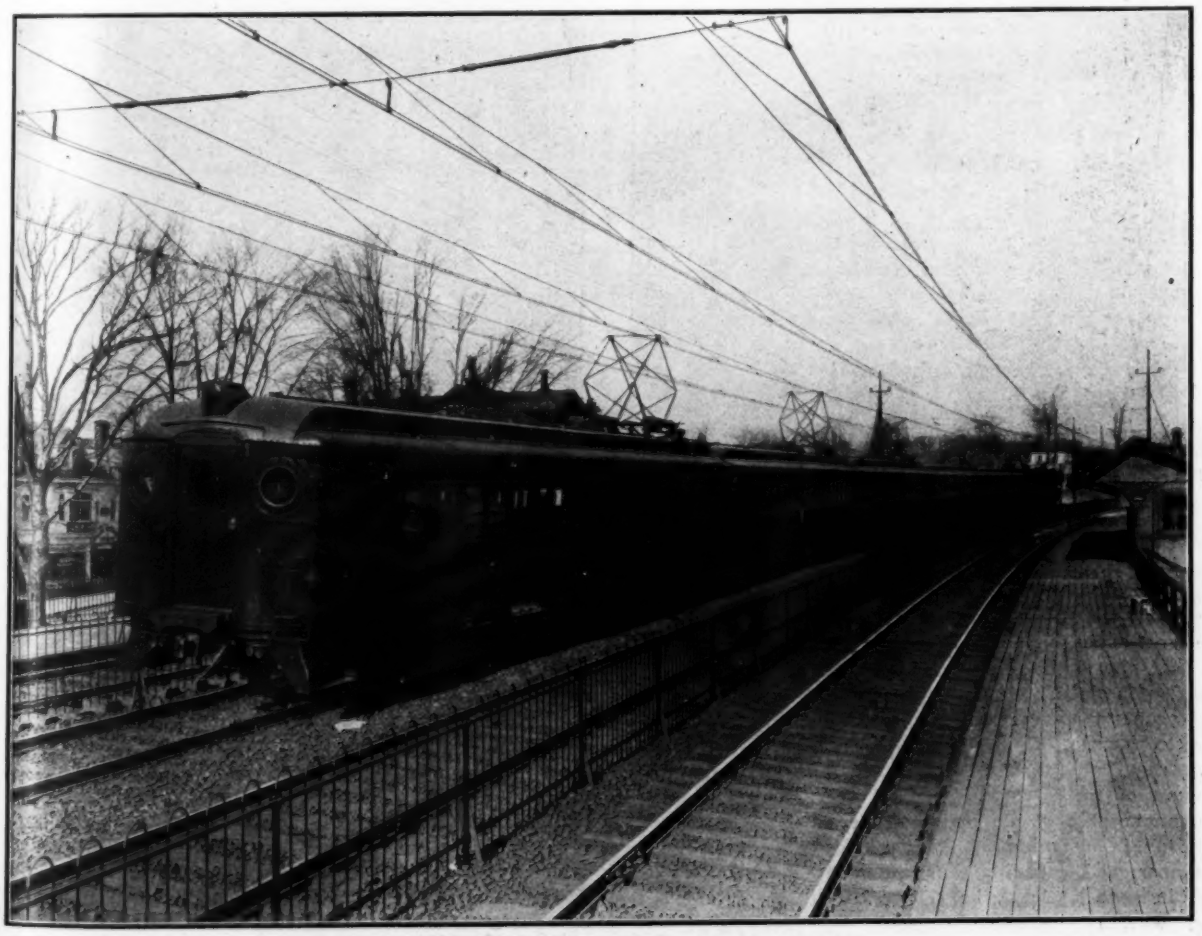
The November meeting of the Meter Department Branch was devoted to a discussion of subjects related to metering. Henry Duus spoke on "Sangamo Meters" and Paul F. Quinlan, Jr., on "Experiences with Westinghouse Meters."

The November meeting of the Section will be addressed by Douglass Burnett, commercial manager of the Consolidated Gas, Electric Light and Power Company, of Baltimore, Md., on the subject of "Self-Advancement."

FEATURES OF PENNSYLVANIA ELECTRIFICATION AT PHILADELPHIA

This article deals with the important features of the electrification of the Pennsylvania Railroad, from Philadelphia to Paoli, comprising 93 miles of track. Single-phase energy at 11,000 volts, 25 cycles, is employed and all power is purchased from the Philadelphia Electric Company.

The electrification of the suburban service of the Pennsylvania Railroad between Broad Street Station, Philadelphia, and Paoli is the first electrification undertaken by that company in the vicinity of Philadelphia and its primary purpose is to increase the capacity of Broad Street station and thus to relieve congestion at the terminal. Broad Street station is of the stub-end type having 16 station tracks approached by six main line and three yard tracks on an elevated railroad which crosses the Schuylkill River from West Philadelphia, at which point the routes divide for New York toward the north, Washington toward the south and Pittsburgh toward the west. In addition to the through passenger train service accommodated at Broad Street station, there is an extensive suburban service extending over six different routes. The growth of all business in recent years has been such that the limit in capacity of the station has been reached and many plans have been formulated and discussed for relief by physical enlargement of the station and its approaches or by rerouting movements. All of these plans involve extensive reconstruction and would require much time for their accomplishment so that some more expeditious method of obtaining relief was desirable. The possibilities of electric traction as a means to this end were examined into by committees consisting of operating officials of the road and their analysis and estimates indicated that during the rush hours the relief which would be secured by the electrification of the suburban Paoli service alone would be equivalent to increasing the station capacity by an amount equivalent to 17 or 19 per cent of the Paoli service and for the station as a whole would be equivalent to the relief accomplished by reducing the total number of trains by about 8 per cent. A similar increase in capacity would result from the electrification of other suburban lines and work in connection with one of these, namely, the Chestnut Hill service, has already commenced. This increase in capacity is effected by electrification because mo-



Typical Multiple-Unit Train—Pennsylvania Railroad.

tor-car trains are substituted for those hauled by locomotives and thus the shifting back and forth from one track to another of cars and drafts and movement of empty power is eliminated, also there is some gain in capacity due to the quicker acceleration of trains and shorter length of track occupied by a given train when the steam locomotive is omitted. Relief thus afforded by electrification of the Paoli and Chestnut Hill lines is estimated to be sufficient to take care of the normal growth of business for the next seven or eight years and the period of relief can be further extended by the electrification of other suburban lines, should the trial of this initial electric service meet expectations.

It is estimated that under electric operation there will be sufficient saving in operating costs as compared with steam to pay interest on the investment, which, in this case, includes the most expensive portion of the work in that the entire Broad Street terminal with elaborate yard and restricted property lines and approaches thereto form a part of the construction required for a relatively small amount of train service. This is not an unfavorable result under the circumstances, meaning as it does that the increased capacity thus obtained will in part, at least, be self-sustaining, whereas increased capacity by physical enlargement would give no direct return upon the heavy investment. In addiiton there are the other contingent and important advantages of electrification such as higher speed of trains, more punctual service, especially in bad weather, and more cleanly and attractive conditions for the traveling public.

Electric System.

Analysis of service conditions and cost estimates covering all available electric systems led to the conclusion that one using a very high-voltage overhead contact wire and one which eliminates moving machinery in substations for the supply of power is most suitable and also the most economical from the standpoint of both first and operating costs. In arriving at a conclusion as to system, primary importance was attached to the feature of possible long-distance operation over the entire divisions affected rather than to the requirements for present short suburban electric service. In this case 11,000-volt, single-phase, 25-cycle power is supplied directly to the trains from the overhead catenary trolley system.

While the studies which preceded this work involved the possible future electrification of several different railway divisions and classes of service, the present installation covers the suburban passenger service only and involves about 43 trains each way per day from Philadelphia westerly to Paoli on the main line of the Philadelphia division. From Broad Street station the main tracks are electrified for 20 route miles, including also a coach yard at West Philadelphia and a coach and repair yard at the end of the electrified section at Paoli. The present electrification embraces about 93 miles of track.

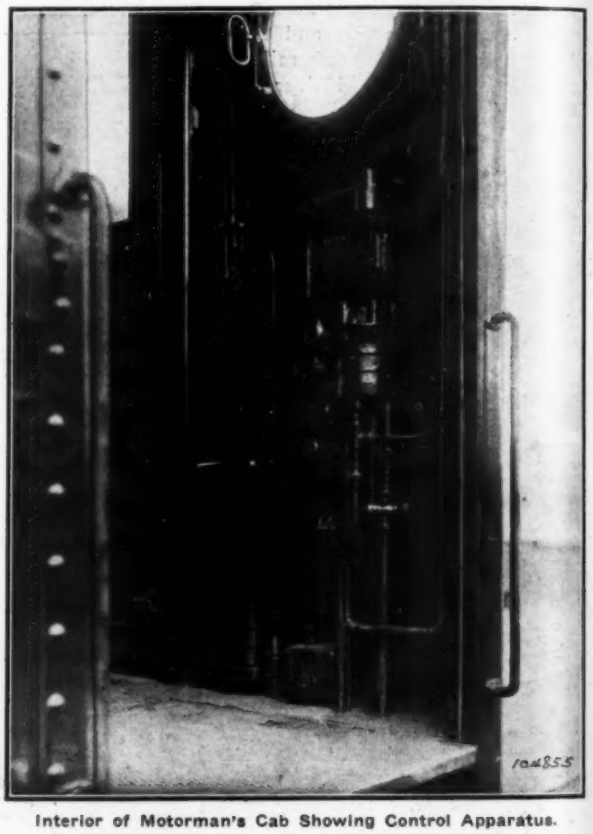
Power Supply.

Power for traction purposes is purchased from the Philadelphia Electric Company and is generated in its main power station at Christian Street on the easterly bank of the Schuylkill River about a mile south of West Philadelphia passenger station. It is delivered to the railroad company at a substation on the westerly bank of the Schuylkill River opposite the main generating station, the connection between the power house and the substation consisting of armored submarine cables under the river.

While the present service is on one phase only of the power company's three-phase generating system, the plan is to supply the succeeding or future electrification power requirements from the remaining phases.

The power is delivered to the railroad company's substation at 13,200

Four Transmission Lines Between Arsenal Bridge and West Philadelphia Substations.



Interior of Motorman's Cab Showing Control Apparatus.

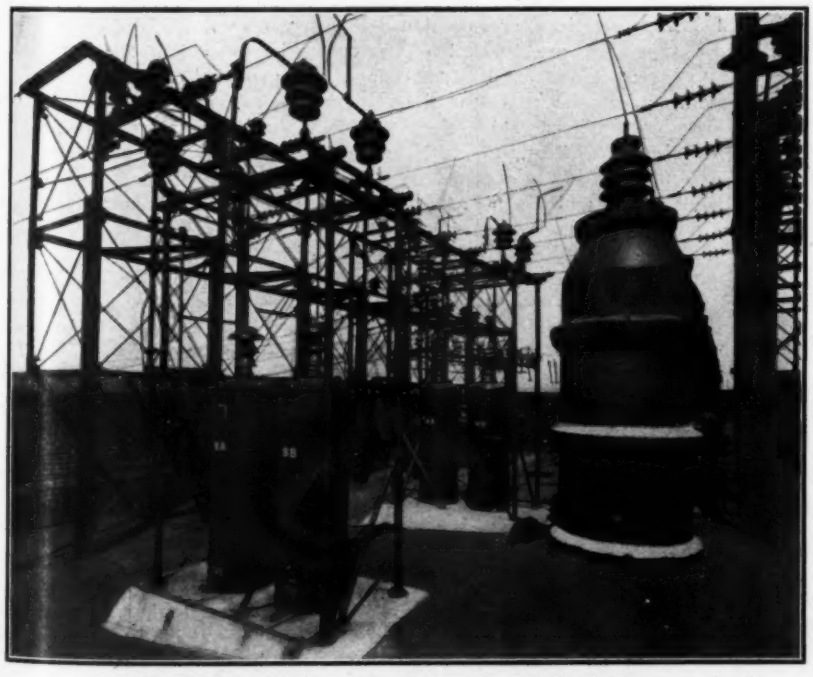
Arrangement of Apparatus in Typical Substation.

volts. Here it is stepped up to 44,000 volts and by means of duplicate single-phase overhead transmission circuits is transmitted to the step-down substations. Special provisions have been made by the Philadelphia Electric Company to balance this single-phase load as well as to correct for the relatively low power-factor in order that the full three-phase capacity of its generating units may be available.

Transmission.

Power at 25-cycles and 13,200 volts is transmitted from the Philadelphia Electic Company's power house on the east bank of the Schuylkill River to the Arsenal Bridge substation over four 350,000-circular-mil, three-conductor submarine cables. On the west bank of the river, the submarine cables are connected to paper-insulated, lead-covered cables, installed in clay ducts. Switchboard meters are provided on each of the incoming 13,200-volt feeders.

From the Arsenal Bridge substation there are four 44,000-volt single-phase transmission lines to the West Philadelphia substation. These four single-phase lines will tee into the West Philadelphia substation and two of them continue on to the Bryn Mawr and Paoli substations and the other two will later go to the Chestnut Hill substation.



Electrolytic Lightning Arresters on Roof of Substation.

The four transmission lines are carried on brackets on the side of the elevated structure between the Arsenal Bridge substation and the West Philadelphia substation. Beyond the West Philadelphia substation the lines are carried on the catenary supporting structures. Along the right-of-way the lines are carried on both sides of the tracks. Horn-gap switches for sectionalizing are installed on the roofs of the West Philadelphia, Bryn Mawr and Paoli substations and lightning arresters on the roofs of all substations.

The transmission lines are 2/0, seven-strand, hard-drawn copper wires. Wires are spaced 5 feet apart where the two wires of a single-phase feeder are on the same cross arm and where there is more than one circuit on a pole the vertical spacing is 3 feet 6 inches. The lines are protected by a three-eighths inch steel ground wire on the top of the poles. Where the transmission lines pass under highway bridges, the ground wire is dead-ended on the bridge structure and the wires carried on post-type insulators.

Where the lines pass under the Belmont and Girard Avenue bridge, which on account of its width approaches tunnel conditions, they are covered with rubber and varnished-cambric insulation. The joints between the bare and insulated wire either side of the bridge are made outside of porcelain sleeves filled with compound. The wire is continuous throughout the sleeve, the insulation being tapered off inside the sleeve.

At the Arsenal Bridge substation, the lines are protected by relays which operate on overload and on an unbalanced load in either leg caused by a ground. In the other substations the relays operate only differentially, and in case of a ground between substations the circuit on which the trouble occurred would be cut out first in three of the substations and finally at the Arsenal Bridge substation. Overload relays are provided in the 13,200-volt lines at the Philadelphia Electric Company's power station and reverse current relays in these feeders in the Arsenal Bridge substation.

The pin-type porcelain insulators used on the transmission lines are 8.4 inches high and 12 inches in diameter, made up of four parts.

These insulators withstand the following tests:

Dry flashover	165,000 volts
Wet flashover	120,000 volts
Puncture	250,000 volts

After erection, the transmission lines were tested out at a potential of 66,000

volts, or three times the working pressure, to ground.

Substations.

Transformer substations are provided for stepping up the voltage for transmission and for reducing it at suitable points along the railroad to that required in the contact conductors.

The Arsenal Bridge step-up substation is located on the west bank of the Schuylkill River opposite the power house of the Philadelphia Electric Company, about one-half mile distant.

The West Philadelphia substation is located in the West Philadelphia yard, one mile from the Arsenal Bridge substation.

The Bryn Mawr substation is located at Bryn Mawr, 10.2 miles from the Arsenal Bridge substation.

The Paoli substation is located at Paoli, 20.1 miles from the Arsenal Bridge substation.

The substation equipment is housed in substantial fireproof brick buildings adjacent to the tracks. The lightning arrester equipment and high-tension feeder-sectionalizing switches are located on the roof; the bus bars and switching equipment on the second floor, and the transformers on the ground floor.

The installed capacities of the substations are as follows:

Arsenal Bridge, three 5,000-kilovolt-ampere step-up transformers.
West Philadelphia, two 2,000-kilovolt-ampere step-down transformers.
Bryn Mawr, two 2,000-kilovolt-ampere step-down transformers.
Paoli, two 2,000-kilovolt-ampere step-down transformers.

Space is provided in all substations for 100 per cent increase in capacity.

The transformers in all substations are of the 25-cycle, single-phase, oil-insulated, water-cooled type. The primaries of the step-up transformers in the Arsenal Bridge substation are wound for 13,000 volts and the secondaries for 44,000 volts. The primaries of the step-down transformers in the other substations are wound for 44,000 volts and the secondaries for 11,000 volts. Several voltage taps are provided on the primary and secondary coils of all transformers. The cases of all transformers are mounted on wheeled trucks and in each substation a transformer truck and chain hoist are provided for handling the transformers and cores. They are also equipped with thermostats which operate an alarm bell in case of high temperature in the transformers. Oil filtering and drying apparatus is located in each substation and a tank is provided into which the oil may be drawn off from the transformers.

The neutral point of the high-tension winding of the step-up transformers is grounded, through a grid resistance, thus limiting the potential to ground from either side of the 44,000-volt transmission lines to 22,000 volts.

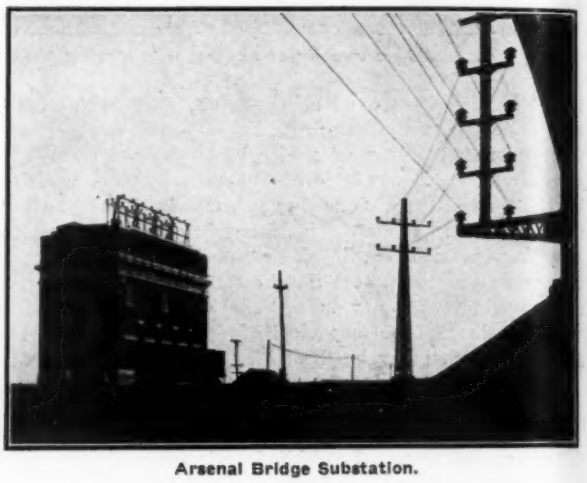
The lightning arresters on all 44,000-volt and 11,000-volt lines are of the electrolytic type and are located on the roofs of substations. All 44,000-volt circuits are connected to the buses in the various substations through oil circuit-breakers. The tanks of these circuit-breakers are made of heavy boiler plate and they are arranged along the floor without barriers. The circuit-breakers of the 11,000 and 13,000-volt circuits are of the oil type, those on the 11,000-volt trolley circuits being two pole with a reactance connected across one pole. The circuit-breakers are automatic and remote controlled. One of the accompanying illustrations shows the arrangement of apparatus in a typical substation.

Open buses mounted on insulators carried by pipe framework are used throughout. In general all power wiring is bare and copper tubing or solid wire is used. Sufficient clearance has been provided so that no barriers are required between buses or wires except in the case of the incoming cables from the Philadelphia Electric Company in the Arsenal Bridge substation. Control, instrument and lighting wires are rubber insulated and run in conduits. The 44,000 and 11,000-volt buses are sectionalized in each station normal operation being with these bus disconnecting switches closed. In the step-down substations one transformer is connected to each side of the bus. One leg of the 11,000-volt side of all step-down transformers is connected to a bus through a disconnecting switch. This bus is connected to the track rails.

Power for the opening and closing of oil circuit-breakers is obtained from the 44,000 or 11,000, 25-cycle buses except in the case of the Arsenal Bridge substation where power is obtained from the 13,000-volt bus. Two transformers are provided in each substation, stepping down to 440 and 220 volts. The closing solenoids and hand trip coils on all circuit-breakers are operated on 440 volts. Series type relays are provided for the automatic tripping of all circuit-breakers. Power for lights and miscellaneous purposes is also obtained from these transformers. Sixty-cycle power is also provided in all substations to trip circuit-breakers in case of the loss of the 25-cycle traction power.

Except in the West Philadelphia substation where the power director or system operator is located there are no attendants. A switchboard, with the necessary instruments, controllers and indicating lamps, is provided in signal towers near the Arsenal Bridge, Bryn Mawr and Paoli substations. This board is connected with the board in the substation through a control cable and the opening and closing of circuit-breakers is done by the tower man. Telephones are provided in all substations and the signal towers controlling them so that the power director is in constant touch with all substations and tower men.

West Philadelphia Substation.



Arsenal Bridge Substation.

An alarm bell connected to the thermostat on the transformers is located in each signal tower.

Catenary System.

In order to try out the various types of structures and details considered for this work, an experimental four-track section about a mile long was completely equipped in the fall of 1913. An examination and study of this led to the adoption of what is called the "tubular cross-catenary bridge" for carrying the catenary trolley wires.

One of the illustrations shows one of these structures before any longitudinal wires were erected. On either side of the tracks a tubular steel pole is set and grouted into a concrete foundation. Each pole has a double guy anchoring the pole away from the tracks and spanning the tracks between the poles are two cross wires forming the cross catenary bridge which carries the longitudinal wires.

Section of Line Showing Catenary Construction.

This type of structure has been used throughout wherever the property or arrangement of tracks will permit. Where there is no room for guying, self-supporting structural steel posts have been used.

Each catenary structure or bridge is grounded by means of a copper plate buried in coke. The guy rods are attached to the pole by means of heavy steel castings.

The cross wires are of extra-high-tension galvanized steel strand, the upper strand usually being 0.75 inch and the lower one 0.5 inch in diameter. Both are socketed at each end and at one side a turnbuckle is installed to permit of adjustment. The top and bottom cross wires are joined together by means of a vertical 0.75-inch rod and suitable malleable-iron clamps, etc., at the points where insulators carrying the longitudinal wires are located.

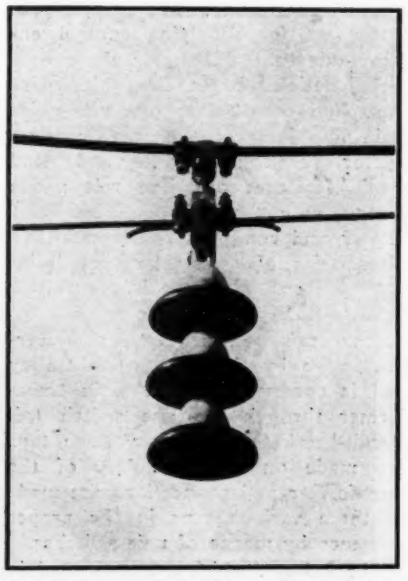
One of the accompanying illustrations shows a detail view of an insulator supported by these cross caternary wires. Each insulator consists of three suspension-type units, the porcelain being 8 inches in diameter and the flashover value of the three being many times that of the line voltage.

The cross wire bridges are located about 300 feet apart on tangents, but are closer on curves, the exact spacing depending upon the degree of track curvature. After the bridges are erected, insulators are suspended approximately over the center of each track; these being precisely over the center of the track on tangents but are offset towards the outside of the curve on curved track.

After the insulators are erected, the main messenger wire is strung out and suspended from them. This is a 0.5-inch extra-high-tension seven-strand double-galvanized steel cable, having a sag of 5 feet in a span of 300 feet. Every mile or two this messenger is socketed and dead-ended on one of the heavy structural signal bridges which are spaced about 0.5 mile apart. The messenger is insulated from the signal bridge by using two or more sets of three-unit suspension-type insulators, these insulators being similar to those used for suspending the messenger from the cross wire and other bridges.

Booster Transformers.

In order to minimize the inductive effect of the traction currents on adjacent telephone and telegraph wires, a special system has been installed. This consists of series or booster transformers located about a mile apart. These transformers are mounted on the signal bridges and the current in each of the trolleys is constrained to pass through a primary coil of the transformer, thus inducing an equal current in the secondary coil, the ratio of the transformers being approximately unity. The secondary coils of these transformers are connected across insulated joints in the track and consequently as all trolley current must flow through the primary coil the secondary coil insures that all the returning traction current, at this particular point of the circuit at least, must flow through the rails. In this manner the traction current is prevented from taking earth returns in parallel with the track or if there is a tendency between these booster transformers for the traction current to seek an earth return this tendency is corrected at the next booster transformer which constrains or picks up all the traction current and again starts it through the rail.



Detail of Insulator Used in Pennsylvania Electrification.

Car Equipment.

One of the interesting features of the electrification is that the standard suburban steel coaches of the type used in the regular steam service have been used for the electric service without structural changes. This was made possible by the fact that the requirements for mounting electric apparatus on the cars had been thoroughly considered at the time when the steel car was introduced upon the railroad. All cars are motor cars, as no trailers will be operated in this service.

The equipment of each car consists of two 225-horsepower, single-phase, air blast-cooled, doubly-fed motors, mounted on one truck, with automatic acceleration, battery-control equipment, and automatic multiple-unit electric air-brake equipment. All of

the main pieces of the electrical apparatus are mounted on one end of the car and the air-brake equipment is mounted at the other end. This gives an uneven weight distribution on the two trucks, approximately 60 per cent of the total car weight being on the driving wheels.

The cars are designed for double-end operation on a 11,000-volt, 25-cycle overhead trolley line. Each car is equipped complete with two motors, having a 24-tooth pinion and a 55-tooth flexible gear; one 11,000-volt pantagraph trolley; one oil circuit-breaker; one main transformer; one switch group complete with reverser and a limit switch mounted on one end plate; one grid resistor; two master controllers; one motor-generator set for supplying control energy; one control battery; three control junction boxes; four nine-point train line receptacles; one nine-point train line jumper; one valve magnet set for operating the trolley and "dead man's" feature; one line relay; one control cutout switch; one combined blower and compressor motor with a Sirocco fan, and one set of details including a control reservoir, control air details, battery switches, etc.

Current is collected from the overhead wire by the pantagraph trolley and is conducted to the main transformer through the line switch (oil circuit-breaker). Various voltage taps are made on the secondary of the transformer and connections are made to these various taps in the proper sequence by means of unit switches.

The motors, which are connected in series, are started and operated up to approximately 15 miles per hour, as repulsion motors, with the auxiliary or compensating field, the armature, and the main field in series. With these series connections, the armature is short-circuited through resistance. Resistance is also inserted in series with the motors on the first step and is cut out on the second step. The third step changes the connections to energize the auxiliary field from one portion of the transformer and the armature and main field, connected in series, from another portion of the transformer, thus affording doubly fed connections. The armature short-circuit is removed when operating as doubly fed motors. Subsequently steps are obtained by increasing the motor voltages.

Each motor has an hourly rating of 225 horsepower and a continuous rating of 200 horsepower when ventilated with 1,200 cubic feet of air per minute. The armature is of standard construction, the communtator and the laminations being mounted on the spider, the former being undercut one-sixteenth inch. The armature is wave-wound, cross-connected and no resistance leads are used between the windings and the commutator. The field windings consist of two entirely independent sets of coils; one, the main field circuit for producing the effective magnetic field; and the other an auxiliary or compensating winding which balances the armature reaction on the field and in addition has a neutralizing effect on the sparking voltage. The field consists of six poles, the coils being of copper bars suitably insulated, connected at the ends by straps.

Trains of from two to seven cars are operated in regular service, the average acceleration on a straight level track being approximately one mile per hour up to 30 miles per hour, with a balancing speed of 60 miles per hour.

Signals.

Throughout the electrified zone, it it was necessary to change the existing direct-current track circuits to alternating-current track circuits and to provide impedance bonds which permit the return of the 25-cycle traction current, but sectionalize the various track circuits so far as the 60-cycle current is concerned.

In the electrified portion of the Philadelphia Division, about 15 route miles, all four-track, the old form of semaphore signals have been replaced by those of the electric-light type in which different rows of five lights each with suitable lenses indicate the various positions of clear, caution and danger.

In order to provide proper vertical clearance for the catenary wires as well as to provide points for anchoring same, practically all the old signal bridges in the electrified zone were replaced with ones of considerably heavier design.

In order to nullify the induction effect of the traction current in the signal circuits of adjacent tracks, resonant shunts have been installed which permit the local induced currents to be shunted around the track relays and thus avoid disturbing the signal circuits.

Power for the operation of signals is supplied from the West Philadelphia and Paoli substations. In the West Philadelphia substation there are located two 150-kilovolt-ampere motor generators with the necessary step-down transformers and switchboard apparatus. Power at 11,000 volts and 25-cycles is taken from the trolley bus and stepped down to 2,200 volts for the motor of the motor-generator sets. Power for the signals is generated at 3,400 volts, 60 cycles, and supplied to the signal system over three single-phase feeders.

The design and construction of the electric installation was carried out by Gibbs & Hill, consulting electrical engineers for the company, in co-operation with the engineering department and the officials of the road. All construction except that of substation buildings and inspection building, which were covered by outside contracts, was carried out by a specially organized force. The electrical equipment was supplied by the Westinghouse Electric & Manufacturing Company.

Electrical Phenomena in Gases.

Electrical phenomena in vapors and gases formed the subject of the joint meeting of the New York sections of the Illuminating Engineering Society and the American Electrochemical Society held on the evening of November 11, at the Engineering Societies Building, New York City. Three papers were presented as follows: "Unstable States in the Arc and Glow," by Walter G. Cady, of Wesleyan University, Middletown, Conn.; "Gaseous-Conductor Light," by D. McFarlan Moore, General Electric Company, Harrison, N. J.; "Electric Arc in Complex Vapors at Reduced Pressures," by W. A. Darrah, Ohio Brass Company, Mansfield, O.

The first speaker reported the results of a large number of tests with reference to voltage and current conditions and his charted findings should be of great aid to the research chemist.

A new portable type of carbon-dioxide color-matching tube was demonstrated by Mr. Moore, upon which a number of tests were reported by others, also connected with the General Electric Company. This lamp is described on page 949 of this issue.

The work of Mr. Darrah in evolving a set of materials which would produce a long arc in a gas-surrounded lamp was described by him in great detail and a working model was demonstrated. The features of this model were as follows: An exhausted glass bulb similar to a large incandescent lamp is provided with tungsten terminals placed four inches apart. The bulb is fed with a combination of titanium tetrachloride and bromine, the vapors from which play around the arc and produce a brilliant bluish-white flame.

Chairman C. S. Fink conducted the meeting with briskness and dispatch with the result that all speakers had time to be heard. There were written discussions on all three papers from Dr. Mott of the National Carbon Company; these were read by Mr. Moore who also discussed them. Dr. McKay, J. B. Taylor and F. A. Benford also spoke.

In Pennsylvania hired motors and fans are exempt from levy and sale on execution for rent due.

Commercial Practice
Management, Rates, New Business

Telephone Display Adds to Attractiveness of Department Store Show Window.

A novel window display in the show window of a dry goods firm at Brockton, Mass., featured the value of the telephone in the conduct of a modern merchandising establishment. A miniature pole line was installed along the front of the window, with a private-branch exchange switchboard connected with batteries, showing how calls are handled in the store.

In the center of the window was installed a small electric motor which rotated four signs advertising the usefulness of the telephone and the low cost of toll calls. To the motor were attached 35 telephone instruments, some of them representing the different departments of the store reached by the private-branch exchange, and others showing the rate for toll calls to towns and cities surrounding Brockton.

By an ingenious arrangement, line lamps were attached to each instrument, and by a flasher operated from the motor were lighted intermittently, illuminating a card which bore the name of the store department or the toll rate to the distant exchange.

The window, which was designed by Grover C. Perkins, wire chief of the New England Telephone and Telegraph Company, attracted much attention, with resulting advertising value to the telephone company and to the store. A view of the window is shown herewith.

Department-Store Show-Window Display Based on Telephone Service.

The Function of a Utility Company in a Community.

In an address on the subject, "What it Means to be a Public Servant," delivered at a recent meeting of the Employees Club, Donald McDonald, vice-president and general manager of the Louisville Gas & Electric Company, passed on some exceedingly practical ideas to those who heard him. His theme was that the position of the company is that of a servant to the people of Louisville and he elaborated the argument as follows:

"A company such as ours is created for the purpose of supplying certain wants of the people. In other words, of being their servant along certain lines. The service which it performs takes the place of the work which was formerly done by the people who cut wood, split kindling and laid fires, and cleaned and lighted lamps, to say nothing of the enormous amount of work done in driving machinery. All such work in earlier ages was done by the members of each household; or in the case of the wealthy and powerful, it was done by slaves. In a city of this size, it would require more than three hundred thousand willing and efficient slaves to do the work which is done by our company, and the slaves would not do it as well. In other words, this public servant has brought into the homes of the humblest citizen a comfort and a luxury which was formerly possible only to kings and princes.

"It is well to fix in our minds that the relation of our company to the community is the relation of a servant. The company comes in contact with the public only through the men who represent it. If these men are polite and accommodating, the company gains the good will, which comes to every prompt, polite and accommodating servant.

"No man is so highly placed that he has a right to be arrogant, nor is any man so lowly situated that he need be servile, but all of us who have seen a merchant attempting to sell goods, or a man seeking to gain employment, know that where the matter is personal to himself, as it is in this case, the man will adopt such a tone of voice and such a manner as will gain for him the good will of the person to whom he is trying to sell goods, or from whom he is seeking employment.

"The same anxiety to please and to serve should characterize everyone who represents this company in any capacity. No man need be ashamed of being a servant. The president of the United States has more bosses than any other man in it.

"This matter of courtesy and accommodation is one of the largest factors in business. I have heard people speak of having their wall papering and their painting done by certain firms. When I asked why, it was not on account of

the price of material, or the quality of the work, it was because the concern employed such nice, accommodating men that their presence in a house was not objectionable. I am glad to say that I get many reports from the customers of this company to the effect that the men who have been sent on business relating to gas and electricity proved to be polite and accommodating. Occasionally I get a report of a different character. A man who thinks he is showing his independence by coming into a house with his hat on, and with dirty shoes, is vastly mistaken. He is inflicting a temporary inconvenience on some householder who is entitled to better treatment; he is doing what he can to make the company less popular in the community, and he is deliberately putting himself in that class who are never promoted, and who are dropped whenever the force is reduced, if not sooner.

"Go at the company's business as if it were your own. Let your attitude to the company's customers be that of thanking them for what they have already bought of its products, and hoping that they will buy more. If you have this in your mind, the chances are that both your words and your actions will be all right."

Louisville Electrical Interests Operate "House Electric."

A novel display of an advertising nature in operation at this time in Louisville is being participated in by several of the electrical concerns. The display is a residence, constructed and fully equipped by a Louisville house-building company in co-operation with the electrical supply houses of the city, etc. It is a two and a half story residence, located in a high class residence section of the city and kept open, furnished as if a family were actually occupying it, for inspection of the public. An electric sign contains the invitation to passers-by to step in. All modern electrical conveniences are displayed in their natural setting and the wiring and lighting equipment is in accordance with the most modern practice.

Boston Edison Company Makes Electric Cooking Demonstration.

The Boston Edison Company is featuring electric ranges in its show windows. Apparatus of several types are displayed and offered for sale. During the three weeks, November 22 to December 11, a model kitchen will be set forth in the show window. This will consist of an ornamental tile background and electrically-operated cooking, washing and other domestic apparatus, with four women demonstrators in charge.

Electric Cooking Cheaper Than Gas in Salt Lake Apartment Building.

Repeat orders are generally regarded as the highest testimonial for a product. Just one year ago the Utah Power & Light Company, of Salt Lake City, made a contract with Brigham Whitmore to install 26 electric ranges in a new apartment house he was building. This was the first apartment in the city to use electric ranges. Mr. Whitmore entered into the contract with some misgivings. His doubts centered about two points, first, he feared the cost of electricity would be more than the class of tenants to whom he was catering would care to pay, and, second, he thought that if the apartments were equipped with electric ranges some prospective tenants migh be deterred from renting, because they did not understand their operation. The electric company, however, had secured his confidence, and he was willing to try the experiment.

The installation was completed just before the close of last year. The average bill during the past nine months has not varied more than a few cents from two dollars, whereas, the average bill in another apartment owned by Mr. Whitmore, which is equipped with gas ranges, averages around two dollars and twenty-five cents per month, the class of tenants being substantially the same. Furthermore, the fact that the apartments were equipped with electric ranges has proven to be an advantage in renting them, some of his tenants even having gone so far as to tell representatives of the electric company that they would not move unless they could find another suitable apartment equipped with an electric range.

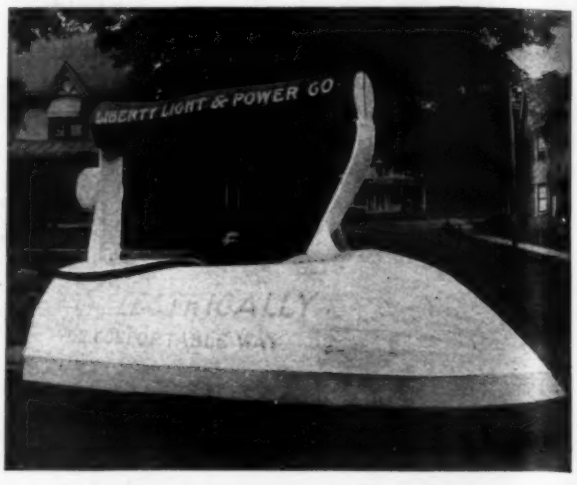
Mr. Whitmore has decided to remodel and modernize the building now equipped with gas ranges, and has recently entered into a contract to purchase 80 Hughes electric ranges from the Utah Power & Light Company for this purpose. This magnificent repeat order is in itself the strongest possible testimonial that electric ranges have made good. The unqualified success of this initial installation has made possible the installation of complete electric range equipment in six other apartment buildings in Salt Lake City during the past year.

A Unique Electric-Iron Float.

The accompanying illustration shows a float that was generally conceded to be among the best of the 117 that participated in the recent parade held by the business men of Liberty, N. Y. The float, which was built and entered by R. M. Sloan, superintendent of the Liberty Light & Power Company, was a representation of a Westinghouse type B electric iron, and was mounted on a Ford runabout.

Following the business men's parade, the firemen of Liberty held a parade and the "Iron" float was selected for participation therein as one of the best decorated in the previous event.

Realizing the advertising advantage to be gained by his company from a continued exhibition of the float, Mr. Sloan has mounted it on the roof of his power house where it can be seen easily from all parts of the city.



An Effective Electric-Iron Float.

The details and cost of construction of the float are given for the benefit of those who may have occasion to build a similar one.

The framework is made of half-inch strips of lumber, over which muslin is tightly stretched; sufficient padding is placed on the inside of the frame to prevent scratching the car. The muslin is then well coated with alabastine and when dry a coating of aluminum bronze is applied. The cord is made from four-inch fire hose and the plug receptacle was cut from a cheese box. The iron completely covers the car and the whole outfit measures over all 16.5 feet long by 7 feet wide by 9.5 feet high. The entire iron was constructed and then placed over the body of the machine.

The detailed expense was as follows:

5 pounds alabastine	$ 0.30
3 small cans black paint	.49
3 cans aluminum bronze	3.00
1½ gals. bronze liquid	3.75
8 yards of muslin	.64
Labor, lumber and carpenter work	20.50
Lettering	2.50
Total	$31.18

SUCCESSFUL COMMERCIAL MANAGERS.

W. A. Wolls.

A responsible position in the electrical field has more than one pathway of approach. That by which William A. Wolls, of Columbus, O., became head of the Columbus Railway, Power & Light Company's commercial department was unusually rough, at least in the early stage.

The plans of young Wolls and his parents for his education were frustrated by his delicate health, which compelled him to give up study at the high school period. Without any fixed plan for the future, he was still not content to be idle, and entered the employ of an electrical supply store. His duties here in looking after small contracts, gave him a desired outside line of work. This included the supervision of electric gas lighting, which at that time was used by a few buildings and some of the more pretentious residences. A natural bent toward mechanics was thus developed. His career was decided—he would become an electrical engineer.

On a visit to Columbus of the famous French actress, Sarah Bernhardt, certain unusual stage-lighting effects were demanded. An official of the Edison Electric Light Company, a concern then new in the field, found the problem put up to him a knotty one. Having some knowledge of young Wolls' experience in lighting, he called upon him for assistance. The latter satisfactorily installed the necessary lights and attended to their operation during the engagement.

This led to Wolls taking a position with the Edison company shortly thereafter. For eleven years he remained in its employ, most of the time as a switchboard operator. His hours were from noon until midnight, or vice versa. Such was the short-day system under which more than one now-successful electrician got his start.

With his original purpose in mind, Mr. Wolls gave every spare moment to study. Often he spent several hours over books and technical journals before going to bed upon reaching home at midnight. Good habits and an improved state of health permitted him to keep up the pace. Mr. Wolls later was made chief engineer by the Edison company, later becoming commercial power engineer.

When, in 1903, the company was taken over by the Columbus street railway interests, he went with the new corporation thus formed, as power engineer. In this position he greatly enlarged the scope of its operations by aggressive efforts in securing new business. His knowledge of the local field proved invaluable. Through careful surveys which he had previously made, he knew where every wheel throughout the city was moving, of whatever form of power. This knowledge caused his service to be claimed in an increasing degree by the contracting department, and in course of time he became its head.

His responsibilities took on added importance in 1913, when under the new corporate name of the Columbus Railway, Power & Light Company, the interests he served were readjusted more to present-day conditions. The company adopted the modern policy of exploiting the commercial power and lighting field to the limits which could be realized through enterprise and efficiency. A distinct commercial and new-business department was created, with Mr. Wolls in charge.

Mr. Wolls is modest in regard to any claims as to what he has been able to

W. A. Wolls,
New Business Manager, Columbus Railway, Power & Light Company.

accomplish, but the general officers of the company do not hesitate to say that its commercial department has no superior and few equals in any city of like size in the country. It occupies modern, street-floor quarters at wholly separate location from the street-railway headquarters. One of the primary factors has been to merit public confidence. This spirit expresses itself, among other ways, in the arrangement of the offices, which is both original and unique. They are separated from the appliance displays and from each other by plate-glass partitions. No employee, not even Mr. Wolls, is hid from sight. All are in plain view of the visitor. It is not necessary to send in a card or a name to anyone. The visitor is at liberty to walk into Mr. Wolls' office unannounced, even though Mr. Wolls may be engaged with someone else. The errand may be the contracting for power for a factory or information regarding some small domestic electrical appliance.

"I never have anything to say to one customer that I am not willing any other customer should overhear," states Mr. Wolls. An extreme liberal policy governs the sale of appliances. No customer is allowed to be dissatisfied, even though this means exchange or refund of money after an article has been used beyond any reasonable trial period.

With regard to electrical appliances the company differs from most central stations in carrying a very large stock. On the grounds that it is the most important local electrical institution, it believes that its displays of all goods in that line should be the most comprehensive. Demonstrators are constantly in attendance. No outside canvass is made on appliances, but visitors are attracted to the store through newspaper advertising and the use of private printed matter.

The commercial department has grown so rapidly that additional space is a problem which it is now confronting. At the present time Mr. Wolls has a force of 24 employees. The efficient organization which he has developed gives him time for personal voluntary service in other branches of the company's activities.

Give the Public Electrical Literature.

This suggestion is advanced by W. S. Mendenhall, commercial manager, Grays Harbor Railway & Light Company, Aberdeen, Wash.:

"The electrical journals of the country have done and are doing a wonderful lot of good for the electrical industry. They in turn have to live and each wish to establish themselves before the public as leaders in their field.

"Now why wouldn't it be fair if the industry did just a little for them to put them before the public?

"I have in mind a little stunt for Electrical Prosperity Week which will cost us nothing and will help both them and us a little.

"Every electrical company has their shelves full of back numbers of the leading electrical journals, they are seldom referred to after the first reading.

"Let each company during Electrical Prosperity Week set out a table in their display room and pile it full of back numbers of these journals and place a large placard above it, reading something like this: 'These are back issues of the leading journals of the electrical industry, take some of them home and read what the industry is doing.'

"No doubt many of them would be carried away by visitors, it would help to establish their names with the public, and would keep those who took them thinking electricity at least during the time which they might spend in reading them."

Electrical Construction

BUSINESS HINTS FOR DEALER AND CONTRACTOR.

By G. D. Crain, Jr.

Possibilities of Lamp Business.

In Evansville, Ind., there is a lamp dealer who is making $1,800 a year by devoting himself exclusively to the sale of incandescents. This in itself is interesting, but the proposition becomes still more worthy of notice when one learns that this dealer is blind. All of his sales are made by direct solicitation, the dealer going from house to house and factory to factory, knowing the town well enough to be able to get about without assistance.

This is a wonderful record, considering the handicap under which the salesman is laboring; but it ought to make the retail dealer, possessed of all of his physical senses, a little bit ashamed of himself to get along with sales of a few hundred dollars' worth of lamps a year, when a blind man can go out and roll up profits of $150 a month on the same proposition.

As a matter of fact, the possibilities of the situation are simply unlimited. The field is so big, and the demand is so certain, that it is only a question of how much business the dealer wants to do. If he sets out to make a certain volume during the year, and figures his quota per month and per week accordingly, so that he can step on the "accelerator" when the situation demands, he will be much more likely to realize his ambitions and get the profits out of the lamp business that he is entitled to. If he lets the trade drift along, and waits for people to come in and take his lamps away from him, he will make a minimum amount of money, of course.

Peculiar Advantages in the Trade.

Owing to the fact that lamp manufacturers, in order to protect retail prices, have adopted the consignment feature, by means of which title to the lamps remains in their names, and the dealer does not pay for any stock that remains unsold, handling electric lamps has become the proverbial "cinch." They constitute the only line of staple goods that the writer knows anything about which can be stocked without making any investment, and, naturally, this feature should be considered in estimating the possible profits.

If a dealer is operating with $10,000 invested in stock, the interest on this is $600 a year, which must come off the gross before net profits can legitimately be figured. If total operating expenses are $6,000, then interest is 10 per cent of the overhead. If the latter is 20 per cent, then 2 per cent is chalked up to take care of the interest, and consequently the dealer can make at least 2 per cent more on his lamp sales than he could possibly do on anything else in which he has his money tied up.

This is not to say that the consignment system is an unmixed blessing, for it is not. In fact, some dealers are inclined to lie down on any proposition where they are not compelled to hustle to get their money out of the goods, and it might be a good thing for the business of certain members of the trade if they had to pay for their lamps when they are put in stock. But the method used in distributing them at least emphasizes the unusual opportunities for profits which exist in this department of the business.

The Sliding Scale of Discounts.

Inasmuch as lamps are distributed with a sliding scale of discounts, the dealer who sells the most getting the biggest margin, which applies to his entire sales, there is every incentive, all the time, to every dealer to keep pushing lamp sales. And as the electric lamp is the staple of staples in this field, inasmuch as almost universal consumption is the rule, it should be no trick for the live dealer, who has properly impressed this feature on his sales force, to increase his volume right along.

The dealer who starts in with a small stock, based on his previous sales, and disposes of it quickly, getting a bigger stock—and a longer margin—next time can continue to work this game, and earn rebates on all his previous sales, by the simple plan of increasing his volume sufficiently to graduate into the next higher class. This gives an element of interest—one might almost say a sporting phase—to the situation, and makes the work of selling additional lamps a lively game in which everybody connected with the store is a player.

Going After Contract Business.

The necessity of getting a maximum volume in order to get the top discount should impress the lamp dealer with the desirability of getting all the big business in his territory that he can. And he can go after the important trade secure in the knowledge that he can quote the only price that will be offered the consumer on a standard lamp. No matter how important the factory buyer may be, he will pay just as much to the manufacturer for lamps as though they were sold by the dealer; and when the element of service, including prompt delivery, is taken into account, there is simply no justification for the local consumer whose business is of importance getting his lamps anywhere except from the dealers in that community.

There is one exception to this statement; and that is that where the dealers themselves are so nearly asleep to their opportunities that they fail to solicit the contract buyers, the latter cannot be blamed for going over their heads and dealing directly with the manufacturer. As an instance of the fact that the dealers are neglecting their opportunities in connection with this most important phase of the business, the district salesman of one of the leading lamp concerns makes a practice of getting business in territory where he is not represented by going in and landing a big order from an important buyer.

If the local distributors were onto their jobs it would not be so easy for the outside man to make these sales; and the fact that he can step in, an unknown man, without personal connections of any kind, and possibly with a lamp which is not so well advertised in that community as some others already represented there, and get important, profitable business, makes it look as if the dealer who is not soliciting the contract buyers is overlooking a good chance for business.

He may excuse himself in this connection by pointing out that the extra discount which the consumer gets for quantity purchases makes the business less desirable; but it will be found on figuring the difference between sales in case and less than case lots that.

considering the increased time, trouble and expense involved in selling over the counter, the net profit on the case business is really greater than on the same volume of smaller individual sales. And, as suggested, those case-lot sales are needed to boost the volume and give the dealer the maximum margin on all of his sales, including the small business over the counter.

It would pay every lamp dealer in every town to list all of the consumers important enough to buy in case lots, and to go after them on a contract basis. This would include factories, office buildings, stores, motion-picture theaters and the like. Tying up this trade for a year at a time would be important, too, in that it would come pretty close to swinging all their other electrical business as well.

Putting Men Outside.

It was suggested at the beginning of this article that the record of the blind lamp salesman in Evansville is good enough to show what can be done by the determined dealer. The real secret of his success, and one that can be applied effectively by every member of the trade, is that he goes after the business directly. He works from his home, and goes out on the street and into the offices of his customers.

The electrical dealer-contractor who has a lot of good men on his pay roll often has to "make work" for them, because there is nothing for them to do in the way of contract or jobbing work. It is unprofitable to have them mark time, which is practically what happens; and yet the dealer feels that it is good policy for him to do so, in order to retain his force, and to be prepared for the rush when it comes.

A better plan of holding the force together and at the same time making a profit out of their efforts is to use the slack season in the contracting game by making lamp salesmen out of the extra men, and putting them out on the street selling directly to consumers for cash. Nearly every house that a solicitor enters will be found to be in need of a lamp here or there. Often the householder or his wife forgets to make the necessary purchase when down town, and lamps are switched about from one socket to another, to get the best results with a limited number of lamps. When the lamp man comes around offering the stock for sale he gets a warm welcome, of course, because the lamps are going to fill a long-felt want.

The fact that the lamps are converted into cash, without the necessity of making a mark in the books, emphasizes the clean and profitable character of the business, as well as the effective use which can be made of the spare time of employees in no matter what department. And it goes without saying, that a live man who is out selling lamps is going to find prospects for other electrical merchandise, not to mention wiring jobs.

"Buy Them by the Box."

One of the leading chewing-gum manufacturers, and apparently the most successful, featured for some time in all of his advertising the slogan, "Buy it by the box." He saw the advantage of supplying the consumer with large lots of his confection at a time; first, to anticipate possible competition; and, second, to enable the dealer to increase his sales.

In these two points the electric-lamp business is similar to the chewing-gum trade, and for that reason the dealer should tell his customers to buy lamps by the carton. There is no sense in buying a lamp or two at a time, and if the suggestion is made that it is a good plan to have a few extra lamps in the house all the time to make necessary replacements, it will undoubtedly be carried out, irrespective of the fact that the price per lamp is the same when a carton or only two are bought. Incidentally, the central-station man who is handling lamp sales should remember that keeping consumers well supplied with lamps is going to help the consumption of current, because there will be fewer idle sockets if the consumer always has enough lamps to go around.

Displaying cartons of lamps, quoting prices per carton, rather than per lamp, and making the suggestion to buy on that basis whenever the customer comes in and asks for "a" lamp, will have a good effect in this direction.

Establishing Dealer Individuality.

One reason why some dealers are not as enthusiastic as they should be on the subject of lamp sales is because they figure that lamps are so universally distributed that the consumer can get them anywhere, and consequently that it will not repay effort to attempt to build up a good-sized lamp trade, that any kind of competition will suffice to distract. But experience has proved that this is not the case. The dealer who ties up with a good brand, and pushes that brand, has something that will hold his trade. His customers, being satisfied with the lamps they have been getting from him, will not care to make a change, no matter how good the lamps carrying other labels may be. In this way, if the dealer will really endeavor to hook up his name with that of the manufacturer whose goods he is handling, and will use the window display materials, folders, circulars, etc., whenever he can, he will be able to create and establish a regular, permanent and profitable business on lamps. He has a better chance than distributors of Victrolas, say, and even here individual dealers have been able to develop distinctiveness through service and by other methods. The lamp distributor has plenty of opportunity along this line, if he will only take advantage of it.

Massachusetts Contractors Investigate Licensees' Qualifications.

The Electrical Contractors' Association of Massachusetts has employed a legal representative, in the person of James Wilson of Boston, whose duty it is to go from city to city and investigate the qualifications of holders of Class A or masters' certificates which enable them to engage in the business of wiring for electricity. As a large share of those who were given certificates were not subjected to examination, merely certifying under oath that they had been engaged in the business five years previous to the time the law went into effect, it was believed that a number of firms or individuals received certificates improperly. Already two licenses have been challenged.

The Board of Electrical Examiners is soon to issue a book giving the names of licensees in both the masters' and journeymen's classes, by cities or towns where they do business or reside. This will obviate a large amount of clerical work in the office of the Board, which is applied to continually for information as to local license-holders.

November 17 an examination was held at the State House, Boston, 150 applicants being examined. Of these 13 were candidates for Class A certificates. It is stated at the office of the Board that next year's examinations will include practical demonstrations, such as soldering, splicing, taping, etc., and possibly the connection of instruments and fittings on a model board. It is probable that the 5-years' experience exemption will be done away and all applicants subjected to a test as to their qualifications. The Gas and Electric Light Commissioners will probably adopt the National Code as the basis of examinations of candidates, the licenses of whom are subject to revocation, appeal being to that Commission.

To date about 750 candidates have been examined in both classes.

Carolina College Bequeathed Valuable Laboratory.

By the will of William Kearney Carr, the laboratory of the testator, located in Washington, D. C., and said to be valued at about $100,000, has been bequeathed to the North Carolina College of Agriculture and Mechanic Arts, West Raleigh, N. C. Mr. Carr was a son of a former governor of North Carolina and was particularly interested in radioactivity, discharges through gases, etc.

Among the Contractors.

During the month of October exceptionally important lighting contracts were executed by the McKenney & Waterbury Company, of Boston, Mass. Among the Boston buildings equipped with modern electric lighting fixtures in that time were the Massachusetts Charitable Association Building, rectory for Trinity Church, International Trust Company Building, the Crawford House, Niles Building, Franklin Building, Massachusetts Trust Company Building, Hunnewell Building, Youth's Companion Building and Lombardy Inn. In addition to the above similar contracts were filled for 13 other large buildings outside of Boston, located chiefly in the New England States.

A $25,000 contract has been closed by the Erner & Hopkins Company, Columbus, O., for electrical re-equipment of the Pioneer Pole & Shaft Company's plant, at Memphis, Tenn. Change is being made from the manufacture of specialties for horse-drawn vehicles to automobile parts. This requires almost an entire new outfit. The installation of 55 motors is among the features of the contract. The same company has the contract for electrical work in the new William Bott residence at Marble Cliff, and also for the wiring for the new Martin & Cooke power building at Columbus, O.

What is said to be the largest and most complete electrical equipment for a residence ever planned in Columbus, O., is in the hands of the Correl Electric Company of that city. The F. A. Miller home, costing $60,000, at the suburb of Bexley, is where the work will be installed. It includes wiring for lighting, vacuum cleaning, refrigeration and heating receptacles, with master switches and all up-to-date features.

The entire electrical equipment in the plant of the Western Cartridge Company, East Alton, Ill., is being installed by Charles J. Sutter, 1220 Pine Street, St. Louis, Mo. Twenty buildings in all are involved, devoted to shot shell loading, metallic packing (2), metallic loading (2), bullet mold, bullet swaging, primer, annealing, metallic inspection (3), main manufacturing, warehouses (3), shot shell inspection, shot shell manufacturing, machine shop, office building.

The Beaver Engineering Company, Newark, N. J., has been awarded contracts for electrical work for the new buildings to be erected in connection with the City Hospital.

New System for Hospital Signal Lighting.

The lighting system of a modern hospital is usually controlled from one or more distributing panelboards located on each floor. Branch circuits from these panels are run to the various rooms and the lighting of the individual rooms is controlled by a switch in the side wall. Separable flush receptacles are installed in each room as outlets for fans, heating pads, reading lamps and other electric portables.

Herewith is shown a diagram of a simple, inexpensive and efficient system which utilizes these standard circuits and is installed so that a positive indicating signal can be readily given by the patient. A green light

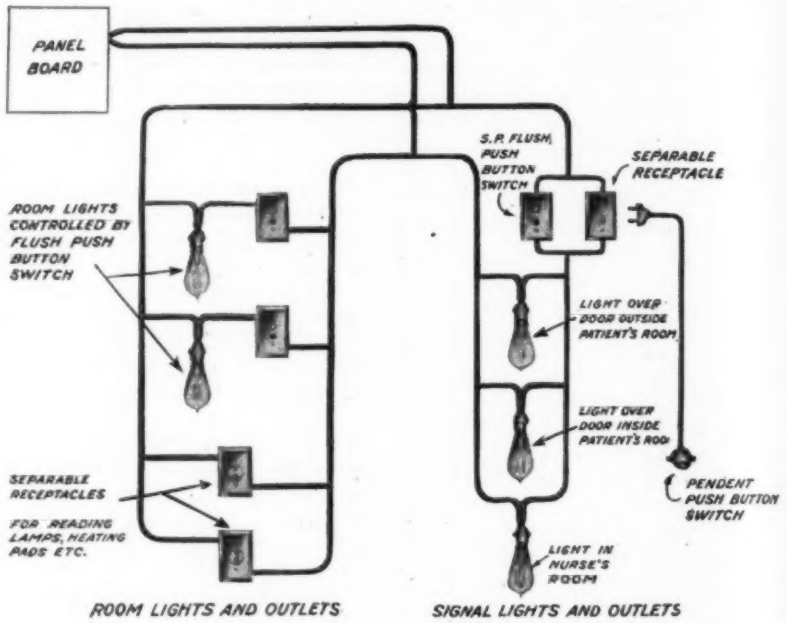

PANEL BOARD
S.P. FLUSH PUSH BUTTON SWITCH
SEPARABLE RECEPTACLE
ROOM LIGHTS CONTROLLED BY FLUSH PUSH BUTTON SWITCH
LIGHT OVER DOOR OUTSIDE PATIENT'S ROOM
LIGHT OVER DOOR INSIDE PATIENT'S ROOM
PENDENT PUSH BUTTON SWITCH
SEPARABLE RECEPTACLES FOR READING LAMPS, HEATING PADS ETC.
LIGHT IN NURSE'S ROOM
ROOM LIGHTS AND OUTLETS
SIGNAL LIGHTS AND OUTLETS

Diagram of Wiring System for Hospital Signal Lighting.

is placed over the door inside the patient's room, and over the door outside the patient's room a red light is installed. Inside the nurses' room is located a red light for each patient's room and a pendent switch is placed at a convenient location and within easy reach of the patient. This switch is connected in series with the line through a flush receptacle of the separable type.

When desiring to call a nurse, the patient pushes the switch button which lights the lamps inside and outside of the patient's door and the lamp in the nurses' room. These lamps will burn until the nurse visits the patient and turns them off at the pendent switch. In addition to the pendent-switch control, the system may also be operated by a push-button switch installed in the side wall.

If desired, a single-button lock-type push-button switch can be used in place of the pendent switch. This switch when operated by the patient is locked in the on position and it is necessary for the nurse to use a key to turn off the lights.

This system has been designed by the General Electric Company, Schenectady, N. Y.

Meeting a Competitor's Bid.

A recent incident, involving financial difficulties for an electrical contracting firm, illustrates more forcibly than any arguments could, the advantages of co-operation among contractors, and the value of association work. The contractors' association, in the town of the incident, does not make any effort to control prices; but at its meetings the various details of work are talked over, and experiences are exchanged frankly. When one contractor "gets in bad" on a job, he is usually frank enough to tell his fellows why, that they may avoid a similar pitfall. The result is that most of the members figure rather carefully on all jobs; and jobs which they secure, even on low bids, usually net a real profit. The firm which got into trouble, however, had never affiliated with the association.

On one occasion the person letting the contract had received an especially low bid from an electrical contractor, who later discovered that he had made an error, and withdrew his bid. The builder went to the non-member firm and announced that such-and-such a bid had been received, asking if the firm would take the work at that price. The work was taken at a loss.

This practice of meeting a competitor's bid has frequently brought disaster.

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H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

Secretary's Message.

The Secretary recently received a very pleasant letter from one of our most distant members, Mr. Wheaton, of Saskatoon, Sask., in which he spoke of the interest our column always aroused when the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN appeared. The Secretary does wish other members would favor his office with correspondence upon matters of interest, and especially such as could be used in these columns.

The New York Section held its fourteenth regular meeting on Monday evening, November 8, in the Municipal Building, Manhattan, G. E. Bruen, superintendent of the Suburban Fire Insurance Exchange, presiding. The attendance was large, the members taking a lively interest in the matters brought forward. The feature of the evening, however, was a most interesting talk by F. M. Griswold, general inspector of the Home Insurance Company.

Mr. Griswold is a pioneer in his line, having been with his company 41 years, and in the course of his remarks carried his hearers back to the period when Mr. Edison completed his first incandescent station at Menlo Park, N. J., describing the applause when the lights were first turned on. He also emphasized the startling figures on fire losses in the United States, showing how the average rate of property loss is now $5.00 per minute!

As a result of P. J. McManmon, inspector in the city department, bringing forward at a previous meeting the subject of corrosion, occasionally met with in electric conduit where this is installed under adverse climatic conditions, it was announced that Alfred E. Braddell, superintendent of the Sprague Electric Works, was to read a paper on the "Evolution and Construction of Electric Conduit and Armored Cable" at the meeting to be held on December 13.

The Eastern Massachusetts Section held its regular meeting on Friday, November 12, and after a brief business meeting, at which the election of officers was laid over until December, repaired to the new factories of the Holtzer-Cabot Electric Company, in Roxbury, where they were most courteously received and escorted over the plant. This is not yet completed, but is in precisely that stage when it presents most of interest to the thoughtful inspector.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

13,000-Volt Conductors.

Question 314.—In a transformer substation would it be proper to install 13,000-volt primary leads of single lead-sheathed conductor in one conduit, conduit having condulet-type fittings? Inspector has advised multiple-conductor lead-sheath cables with potheads. The company claims the former construction is proper for 13,000 volts. Which is correct?

Answer 1(E). We are inclined to the opinion that single-conductor lead-sheathed for alternating-current systems of any potential in conduit would produce expensive inductive experiences. We would not encourage such installations regardless of location.

Answer 2(U). Should use multiple conductor.

Answer 3(D). There is nothing specific in the rules regarding the matter referred to, and it would be entirely a question of judgment as to how the work should be done.

Answer 4(B).* This question appears to be more of an engineering proposition than a question of what the Code requires. Personally I believe the method advised by the inspector would be the better construction.

Answer 5(F and G). We believe the inspector to be justified in advising the use of multiple-conductor cables. The inductive action which takes place under these conditions with single conductor in conduit has two separate results, one is to induce a counter electromotive force in the conductor, which in this case may be negligible on account of being only a small percentage of the total voltage. The other action is an electromotive force generated in the conduit parallel with the conductor, and may have a destructive action, depending on the length of conduit, frequency, and the amount of current flowing in the conductor. We have seen the results of a large number of tests made along this line, one of which resulted in the melting of 16.6 B. & S. gauge copper wires bonding and grounding the conduits, due to the current generated in the conduit itself.

Answer 6(M). For single-conductor lead-sheathed cable in conduit used on a 13,000-volt system it is not believed a condulet-type fitting should be approved. Either multiple-conductor cable and the usual pothead should be provided or the porcelain-type single-

conductor pothead, if the single-conductor cable is used.

Answer 7(P).* If the space is ample the only ground on which an inspector can base an objection to single lead-sheathed 13,000-volt cables in favor of a triple-conductor lead-sheathed cable is the fear of induction troubles, which in the case of lead should be entirely negligible.

Answer 8(O). All of the wires of a circuit should be contained in the same conduit, whether they are in one lead sheath or whether they are in several single-conductor cables. (See Rule 2 *d*.)

Answer 9(T). I am of the opinion that the intent of the Code rules is to require multiple-conductor metal-sheathed cable in approved conduits. Single lead-sheathed conductors would cause self-induction trouble, and for this reason I believe inspector justified in advising the use of multiple-conductor metal-sheathed cable.

Answer 10(R).* The construction as outlined by the inspector is, in my opinion, proper.

Answer 10(R),* The Code does not explain construction of this voltage as much as I could wish. I think that the lead-sheathed single conductors are all right, but condulet-type fittings should be replaced by potheads.

Answer 12(N).* The wires must, under the Code, all be as called for in class C (Rule 2 *d*). Class C, however (Rules 47, 48), says nothing about all wires of circuit being in one conduit as for low-potential alternating-current work.

There would be little effort of induction, because so far as it went the induced current in the lead sheath would neutralize the magnetic effect in the iron (following Lenz's law), so I believe single-conductor cables all in one pipe would be all right.

Neither can I find anything in Code calling for potheads in this case. The index, however, under "Potheads, installation," refers to Rule 8 *b* (just under five-point note on page 15, 1915 Code) and here they are only suggested as a satisfactory method.

By analogy I should insist on full protection against moisture and mechanical injury, but given these adequately controlled I do not see how potheads could be insisted on.

Electricity is used exclusively for cooking in Carlton Court, one of the largest apartment buildings in Buffalo, N. Y.

THE DEVELOPMENT AND OPERATION OF OUTDOOR SUBSTATIONS.—II.

By F. L. Hunt.

The development of outdoor substations is of course dependent on the development of various types of outdoor apparatus. Some of the special features of outdoor apparatus in use in outdoor stations may be of interest and are therefore briefly mentioned in the following paragraphs.

First consider lightning arresters. With the use of voltages from 6,600 volts up, aluminum-cell electrolytic lightning arresters are now becoming almost universal for the protection of such circuits and apparatus. These arresters have been adapted to use outdoors by the development of electrolytes which have low freezing points, and by fitting the covers with bushings similar to roof bushings which are used for carrying high-potential circuits into buildings. In warm climates, and even in this climate, manufacturers of these arresters feel that there is some danger of overheating the electrolyte when they stand in the sun, especially in dark-colored cans, and the practice has therefore become quite common to paint the cans white. This white paint tends to reflect a considerable amount of the sun's heat which would be absorbed by the dark cans, and as far as anything which has been experienced in New England is concerned, this white paint seems to be sufficient protection against the harmful effects of the sun.

The first installment of this article appeared in the issue of November 6. The article was read by Mr. Hunt at a meeting of the Western New England Section of the National Association of Electrical Inspectors, held at Greenfield, Mass., on October 13. The first portion of the article reviewed the development of outdoor substations, the reasons for their choice, their advantages and disadvantages. The arrangements of the Chicopee and Agawam substations of the Turners Falls Power & Electric Company are referred to.

Owing to one or two rater bad fires which have occurred when, for one reason or another, these lightning arresters have been overheated so that the aluminum cones have been damaged, the insurance companies have become considerably alarmed about the danger of fire from such arresters, and at the present time they recommend very strongly against the installation of aluminum arresters inside a station or substation. This feeling on the part of the insurance underwriters makes it almost necessary that electrolytic arresters be placed outdoors or in separate fireproof compartments in all important stations.

Oil switches have been developed for outdoor use up to 110,000 volts, and they have apparently proven very satisfactory in actual operation, as there are many installations now which have been in use for a number of years, in some cases where the oil switches are almost entirely covered by snow in the winter time. The switches are built with bushings similar to the bushings used in the lightning arresters, and are supplied with oil which does not freeze at a temperature much above zero Fahrenheit. Outdoor switches are made for either hand control or electrical control. When controlled electrically, they are generally operated from a storage battery and control board which would ordinarily be placed inside the building. Outdoor switches are generally built up of separate elements for each pole of the switch.

Air-break switches are built for outdoor uses generally in a manner similar to indoor air-break switches, except that instead of being mounted on a base they are mounted on separate fixtures arranged for suspending in an overhead line with disk insulators placed between the terminals. The operation of disconnecting switches of this kind is made comparatively safe by using operating rods which have ground chains between the operator's hand and the switch, and in the stations with which I have been acquainted we have never found any weather conditions under which the operators experienced any inconvenience in operating the outdoor disconnecting switches in the usual manner.

Another type of disconnecting switch which has come into considerable favor for outdoor use is the horn-gap switch. This switch is able to open a circuit which is carrying load, the circuit being interrupted by the arc rising on the horns until it breaks. Such switches are generally operated by a system of levers arranged so that all three poles can be operated at once. For 60,000 volts and higher, these switches are generally built with two horns on each leg of the switch, so that in the case of a three-pole switch the circuit is opened in six places at one time.

With regard to outdoor transformers, it was thought when they were first considered that there would be great difficulty in making them moisture-proof. Experiences which have been noted in connection with small distributing transformers have brought out the fact that this danger is not so great as was at first thought. One case is on record where 74 transformers, ranging in size from 1 to 25 kilowatts, were inspected after they had been in service from two to five years near the sea-shore, where the moisture

conditions were unusually severe, and samples of the oil were taken and tested. In every one of these transformers the oil showed an insulating quality which indicated that there was no trace of moisture in the oil, in spite of the fact that some of the transformers had been out of service during a considerable period each winter. We have on the circuits of the Turners Falls Power & Electric Company a number of installations of transformers ranging in size from 50 to 125 kilowatts which stand idle during several months in the winter. We test the oil in these transformers before putting them back into service each spring and have had no case in which the oil showed moisture, except in one instance when the transformer had a broken bushing. As a matter of fact, some instances have actually shown that there is as much, or more, danger of transformers indoors absorbing moisture as of those outdoors, since there is apt to be more moisture in the warm air inside a station, and if a transformer has been out of service for some time and is cooled down below the temperature of the room, it will, in the breathing process which is sure to take place with changes of temperature, draw in some of the warmer air from the room, and serious condensation of moisture will result on the inside of the transformer.

At the present time most large outdoor transformers are supplied with a small heating unit which takes about 110 watts and which is placed in the cover of the transformer above the oil. This keeps the temperature of the layer of air above the oil in the transformer a little above the temperature of the outdoor air, so that air which is taken into the transformer in the breathing process will at least hold in suspension whatever moisture it carried at the time of entrance. It is customary in the stations with which I am familiar to test the oil in all the power transformers once in six months. During the two and one-half years which these stations have been in operation, there has been no deterioration in the insulating characteristics of the oil and no signs of water having gotten into them. This statement is true even of the spare transformers which stand idle in each of these stations during nine months of the year.

Outdoor transformers are supplied with oil which freezes at about 15 degrees Centigrade or near zero Farenheit. In this climate the temperature goes lower than this at some periods of the year. Various methods are used to prevent the oil from freezing. In the case of oil-cooled transformers the temperature does not go down sufficiently to endanger transformers that are in use 24 hours of the day, but it is necessary to make some arrangements to prevent the freezing of oil in idle transformers which may be kept as spare units, in order that they may be on hand for instant service in case they are required. This is accomplished with oil-cooled transformers by one of three methods; either by connecting the transformer on the circuit during the cold periods and keeping it excited up to voltage, or by placing electric heating units inside the transformer which can be connected in service in cold weather, or by placing electric heating units underneath the transformer which may be connected in cold weather. In the case of water-cooled transformers, the above schemes may be used and in addition it is sometimes arranged so that the warm water from the transformers which are under load is circulated by pumps through the idle transformers. In the case of water-cooled transformers, it is necessary to insulate the water coils against freezing. In the case of the transformers in the Chicopee and Agawam substations, which have already been described, the spare transformers are placed on the circuit idle from about January 1 to March 10 each year. This covers a period during which the temperature seldom goes below zero for any length of time.

Outdoor metering has recently been faciliated by the development of outdoor metering equipment suitable for voltages of from 6,600 volts up to 66,000, in which the current and potential transformers and meters are arranged in a suitable iron box into which the current is brought through three bushings similar to ordinary roof bushings. This makes an equipment much less expensive than that which has heretofore been used for outdoor metering, and in which each separate current transformer required one high-voltage bushing and each potential transformer required two high-voltage bushings. With this development outdoor metering will be very little more expensive than indoor metering, and will complete the equipment necessary for small outdoor substations where loads of from 50 to 500 kilowatts are fed from passing transmission lines.

In conclusion, I might add that the experience of the Turners Falls Power & Electric Company, with which I am familiar, with outdoor equipment on high-tension transmission lines installed during the last three years has been very satisfactory. There have been only three brief interruptions to our service since the new line and substations have been put into operation which could be laid to this part of the system. One was caused by a 1,000-kilowatt outdoor transformer breaking down in the Agawam substation; one by four disk insulators in series breaking down in the overhead work of the Chicopee substation; and one was due to the burning of a set of outdoor aluminum lightning arresters at our Amherst substation. It seems proper to say, therefore, that the outdoor substation will unquestionably become more and more popular, since it is sure to offer a considerable saving in a great many cases, and this, along with its other advantages and the perfection which outdoor equipment has now reached, will in my opinion tend to increase the use of outdoor substations very rapidly.

In a recent discussion of this matter at a meeting of the American Institute of Electrical Engineers it was evident that all the engineers who had operated outdoor substations were very enthusiastic about them, while the only ones who seemed conservative about their usefulness were those who had not had much experience with them.

Report Shows Lightning Rod Protects Property.

The United States Bureau of Standards is about to issue a report of a survey of statistical data relating to life and property hazards from lightning and also of existing methods of protection against lightning. The field covered does not include electric power and signal systems, but does include buildings of various kinds, precautions to be observed by persons in thunderstorms, and interesting information in regard to lightning.

The paper is, in the main, designed for the layman, although some parts of it are of necessity rather technical. The literature of the subjects of lightning phenomena and protection against lightning was thoroughly searched for reliable information; reports of fire insurance companies and fire marshals were examined, and lightning-rod manufacturers were asked to submit the results of their experience and observations as to how a system of lightning rods should be installed.

The net result of the investigation is to show by means of reliable statistics that the lightning rod, when properly installed, is a trustworthy means of protecting property against lightning. This report, Technologic Paper No. 56, may be obtained by application to the Bureau of Standards, Washington, D. C.

Canadian Government Power Plant at Niagara Falls.

The Ontario Hydro-Electric Power Commission has completed a survey for a Government power house on the Smeaton farm, between Queenston Heights and Niagara Falls, Ont., Canada. Plans for the power station have been in preparation. The use of the surplus waters from the Welland Canal is projected, carrying the water to the generating station through a canal running from Chippawa Creek.

Public Service Commissions

Conducted by William J. Norton

INDIANA.

The Laporte Gas and Electric Company. The Commission has approved a contract for city lighting between the company and the city of Laporte. The contract provides the following rates, which are to stand "until further order of the Commission": for each 400-candlepower lamp, installed and maintained by the company, $57.50 a year; for each 100-candlepower lamp, $24 a year; for each boulevard post, lighted and maintained, $48 a year. The minimum number of 400-candlepower lamps is fixed at 225 and the minimum number of 100-candlepower lamps is to be twelve. The rates are to go into effect January 1, 1916.

MAINE.

The Turner Light and Power Company was granted permission to extend its system and furnish electric service in the town of Buckfield. The Buckfield Water, Power and Electric Light Company, while primarily operating as a water utility, has been furnishing some electric service in the town, and the Commission is very careful to state that, if it were possible for the company in the field to supply the service, the Turner company would not be allowed to enter. The decision says:

"Two courses are open to the Commission: to require the present company to furnish adequate service, or to permit some other company to do so. The former ought to be done, if practicable, because the interests of minority stockholders and bondholders should be protected, even if the management is negligent, and it should not be suffered through its negligence to jeopardize such interests.

"But this does not appear to be a case of failure to do what the company is able to do. It cannot furnish such service with its present plant and physical resources. The evidence indicates that a plant sufficient to supply the needs of Buckfield would cost more than the business would warrant. This view is substantiated by the fact that the company has not seen fit during these past few years to equip itself to take on the business which was knocking at its door. Under these circumstances we do not think that the position of investors in the local company would be improved by an attempt to require its officers to meet the demand for service. There is, then, but one other recourse, the admission of another company."

The order provides, however, that the Turner Company shall file with the president or treasurer of the Buckfield company a written proposal to purchase the property of the Buckfield company employed in furnishing electric service, at a reasonable estimate of its value, "before it begins to construct any part of its plant, pole lines, or other equipment in the town of Buckfield, or to furnish any service therein."

The Central Maine Power Company was authorized to purchase the property of the Waldo Water and Electric Light and Power Company, and has under consideration the application of the same company for authority to purchase the property of the Bath and Brunswick Light and Power Company. The petition states that by the proposed consolidation of these properties substantial economies will be effected, which will ultimately greatly reduce the price of electricity to its consumers.

The company was authorized to issue is six-per-cent cumulative preferred capital stock, in the total sum of $122,500, to be sold at not less than par, provided, however, that it may incur selling expenses not exceeding six per cent of the par value of the stock actually sold.

NEW HAMPSHIRE.

Nashua Street Railway. The Commission denied certain petitions for extensions of the Nashua street railway. In the decision, written by Chairman Niles, the Commission says: "An electric railway may often be justified in extending its lines with a view to probable further development of the territory to be served, though an immediate return upon its investment cannot be expected. But the judgment which determines what speculative risks of this nature shall be taken must be the managerial judgment—the judgment of those whose money is to be risked.

"If it were clear that the venture would ultimately prove profitable, or if the company were gaining an excessive return upon other parts of its system, it might be reasonable to compel it to make such an extension. But no such situation here exists. And we find no justification for such an order as is requested."

NEW YORK—Second District.

South Shore Natural Gas & Fuel Company. The petition of the residents of the town of Chautauqua, asking that the South Shore Natural Gas & Fuel Company be compelled to reduce the price for gas to the same amount charged in neighboring communities, has been dismissed by the Commission. The decision brings out the point that rates may be different without being unjustly discriminatory.

Commissioner Hodson points out in his opinion that the complainants have introduced no testimony in their case to show that the rates complained of are in themselves unreasonable, or that the lower rates in the adjoining territory are fair and reasonable.

Citing cases previously decided by the Commission and upheld by the courts, the opinion further says: "These cases uphold the principle that gas and electric companies are not prohibited by the law from giving a preference to particular persons or a certain locality, and thus discriminate against other persons and localities; and it is only when such preference is undue or unreasonable and the discrimination is unjust, that the Commission may intervene."

Fulton Light, Heat & Power Company. The Commission has dismissed its order to show cause why a penalty action should not be instituted against the Fulton Light, Heat & Power Company for selling certain securities at a price less than that authorized by the Commission and for attaching to the stock certificates a premium coupon entitling the purchaser to free electrical goods. The officers of the company have informed the Commission that the stockholders have paid into the company's treasury a sum equal to the difference between the price which should have been received for the securities under the Commission's authorization, and that for which they were sold to certain bankers and individuals and all the money represented by the coupons for free electrical equipment.

Conference on Valuation of Public Utilities.

Meeting Arranged by the Utilities Bureau in Philadelphia, November 10 to 12.

A discussion on the valuation of public utilities was held at the Hotel Adelphia, Philadelphia, Pa., November 10 to 12. This conference was arranged by the Utilities Bureau, which grew out of the conference of mayors held in the same city one year ago to discuss the relations of municipalities and public utilities. According to a resolution passed at the conference, similar conferences will be held annually in the future. This conference was attended by representatives of public service commissions, municipalities, and public utilities and by appraisal engineers, utility experts, college professors and others interested in the subject, the total registration approaching 200.

The principal difference of opinion brought out by the conference was in regard to the basis of valuation upon which utilities should be permitted to earn a return. It was made clear that in cases where the question of confiscation entered and the matter is taken to the courts for decision upon this point, a valuation based upon the reproduction cost of the utility property in its present condition is to be regarded as the "fair valuation" upon which the courts will require that the utilities be permitted to earn a return. In considering the question as to whether rates are reasonable, however, this is not the only basis for consideration and action, as has been exemplified especially in Massachusetts, where the original cost of the property has always been given the greatest weight by the commission in determining rates, and in no case has appeal been made to the courts under the plea that the rates were confiscatory.

With respect to intangible values, the weight of opinion was that such elements of value as are designated under the terms "franchise value" and "going value" should not be recognized for rate-making purposes. A number of the speakers also objected to permitting utilities to earn returns upon the unearned increments in land values, but it was considered that legally the present valuation of land actually used for utility purposes must be considered in making appraisals.

One of the most interesting discussions was that upon land values, which came up mainly at the session on Thursday evening. After a formal paper by Hammond V. Hayes, consulting engineer of Boston, entitled "Principles to be Applied in Valueing Land," the subject was discussed by A. E. Helm, counsel for the Kansas Public Utilities Commission; F. W. Stevens, of the New York Central Railroad; Milo R. Maltbie, former New York commissioner, and others. Mr. Helm took the view that railroad rights of way are public highways and that no allowance in rates should be permitted for increases in their value. In many cases such lands are donated by individuals or by communities and it is not fair to make the public pay interest upon the increasing value of its own donations.

Mr. Stevens, who was former public service commissioner in New York State, maintained that the decisions of the United States Supreme Court require the full present value of all existing property to be considered in rate-making, and that fair value meant actual present market value. Mr. Maltbie claimed that if an allowance for depreciation is to be made upon the expense side of the accounts, any appreciation as in the value of land should be entered upon the income side of the accounts. He pointed out, as did also Mr. Eshleman, Mr. Bemis and others, that if fair value is taken to mean present market value, no lowering of rates could ever be effected, since this lowering of rates will itself diminish the market value and hence might be regarded as destroying or confiscating part of the property. With respect to the land question, Mr. Knowles at a previous session had pointed out that the value of a utility property depended upon the rates which it was permitted to levy; that is to say, upon its income, and that any alteration of income affected this value. The value of all land is determined by the income which can be obtained from it actually or prospectively, and by restricting this income a commission or court would be preventing an increase in the value of the land. There is the same justification for restricting the income from this socially created value as in restricting the income from a franchise value which is similarly created by the public.

Seven sessions in all were held, each one dealing with some particular aspect of utility valuation. The first session was called to order on Wednesday evening, November 10, by Morris L. Cooke, acting director of the Utilities Bureau, who introduced Mayor Rudolph Blankenburg of Philadelphia, who made a short address of welcome and acted as presiding officer for the session. In an opening address, Mr. Cooke pointed out that the return to the investor was not a matter of discussion, as no one wished to deny him a fair return upon the actual investment. There is a diversity of opinion, however, between the marketers of securities and those who uphold the public interests as to the proper basis of valuations. He also stated that the financing of the Utilities Bureau had been assured and that it was already in operation, looking out for the public interests in any cities which cared to make use of its facilities.

Mr. Cooke was followed by John M. Eshleman, former president of the California Railroad Commission, and now lieutenant-governor of the state, who read a paper entitled "Criticism of Reproduction Theory of Valuation." He claimed that reproduction value is based upon what it would cost to build a similar plant entirely regardless of the need of such duplicate plant. There are two inconsistencies in the reproduction theory, since it attempts to apply competitive conditions to an actual monopoly, and also imagines the monopoly never to have existed while at the same time present. He quoted Justice Hughes in the opinion on the Minnesota rate case in support of his view. The point of view of those upholding the reproduction theory is as unjust as is that of a community which asks what a utility corporation would sell for rather than have a duplicate plant constructed to serve the community. Original cost should be considered in determining the returns to investors.

H. Findlay French, an attorney of Baltimore, then read a paper entitled "Reproduction Value Versus Fair Value." He pointed out that the fair value of an existing utility is not the reproduction cost but the cost of a modern plant which could render the same service. He claimed that the inclusion of intangibles in the valuation was intended to obtain a real return on an imaginary investment. Reproduction cost less depreciation gives the going concern value as distinguished from the scrap value.

Morris Knowles, consulting engineer of Pittsburgh, opened the discussion and pointed out that reproduction cost should be taken to include paving over mains and every other item necessary for actual reproduction. Whether this cost should be used as a basis for rate-making is another question. The historical cost should be considered

separately. He thought that the conference should consider equity rather than the law of the case, since court decisions change as public opinion changes.

A. B. DuPont, consulting engineer of Cleveland, argued against using either actual cost or reproduction cost, since the fair value of the utility is the price for which it can be bought, and two utilities which have cost the same may have entirely different valuations from the standpoints of service and earning capacity. The subject was also discussed by O. F. Gayton of Chicago, and James E. Allison of St. Louis.

At the session on Thursday morning George W. Anderson, former public service commissioner in Massachusetts, read a paper entitled "How to Get Rid of Reproduction-Cost Theory." He regards the reproduction-cost theory as a serious public menace. It assumes that rates must be based upon fair values, while actual values depend upon the rates. It was brought into the subject not through legislation but through court rulings. He pointed out that rate-making is a legislative function, while the function of the courts is to prevent confiscation. The rule of fair value has been adopted by the courts because the legislative power has failed to definitely fix the basis for rate-making. He favored legislation which would protect the investor and keep good the credit of utility companies through requiring a fair return to be permitted on capital actually furnished.

Edward W. Bemis, of Chicago, then read a paper entitled "Original Cost as the Chief Basis for Fair Value" in which he also advocated original cost as the most just basis to investors and public. Reproduction cost is entirely based upon estimates and is never consistently carried out; thus a five-year average price for materials is sometimes used; paving over mains has been disallowed by the Supreme Court; going value, as allowed in Wisconsin and New York with reference to early deficits, has nothing to do with reproduction cost.

The subject was also discussed by Robert H. Whitten of New York City and Edward P. Burch of Detroit. Dr. Whitten argued that reasonable rates should be based upon the normal cost of production, which is made up of operating costs and return upon the investment. The present cost of production involves the reproduction of the service rather than of the plant providing the service. To determine what it would cost to most economically reproduce the service would, however, be too complicated for application. The return must be enough to attract investment and investors will usually be satisfied with a rate providing a fair return upon actual cost.

Mr. Burch stated that reproduction cost is usually higher than actual cost. An appraisal could, however, be based upon the actual investment without great difficulty. Engineers are usually willing to carry out appraisals without bias, but the attorneys want only what will help their side of the case. He advocated the employment of engineers working directly for the court rather than for either party involved in a rate case.

John H. Gray, F. W. Stevens, F. P. Stearns, John M. Esleman, R. L. Hale and Edward W. Bemis also joined in the discussion. Mr. Stearns said that actual cost should be the basis for future investments and legislation should be passed to this end. It is not always possible or just to apply this idea to old utilities on account of the equities which have been developed. He favored considering the cost of reproducing a property as it was originally produced instead of considering only its present condition, which in fact is very seldom done consistently throughout anyhow.

Charles L. Pillsbury, engineer for the District of Columbia Utilities Commission, then read a paper entitled "The Making and Maintenance of Priced Inventories." This paper considered the basic features of inventory making and the purposes to which it might be applied. Whatever method be used for valuation, an inventory is valuable and one should be maintained by all utilities. The details of such an inventory were considered. Formal discussion of this paper was contributed by James W. Phillips of Philadelphia, F. W. Ballard of Cleveland, and R. J. Meigs of the Western Union Telegraph Company.

At the session on Thursday afternoon John G. Morse, appraisor for the Associated Factory Mutual Fire Insurance Companies, read a paper entitled "Valuation by Approximation" in which he showed the absurdity and uselessness of going into minute details in appraisals of large properties. By using average unit prices suited to the particular case, appraisals can be made in much less time with a final result as accurate as when details are considered. Examples were given.

This paper was discussed by Morris L. Cooke and Walter N. Polakov, who both agreed with the methods of the author.

Delos F. Wilcox, of New York City, then read a paper on "Franchise Values." Franchise values were considered for purposes of taxation, of rate-making, condemnation, involuntary sale, voluntary purchase, and capitalization. For rate-making purposes franchise values need be considered only in exceptional cases where they have been capitalized by the authority of the state. The fact that a franchise is taxed has no bearing upon the case.

In discussing this paper, Henry D. Baldwin, of the Queens County Water Company, took exception to some of the statements of the author. He thought that franchise value should be taken on the same basis for all purposes and if not considered for rate-making it should not be taxed. The method applied in New York to taxing franchises is particularly bad.

Chester A. McLain, of Harvard University, said that confusion results from the failure to segregate the legal and social aspects of franchises. Since a franchise represents a right to earn a return on the physical property, there should be no return allowed on the value of the franchise itself. In some jurisdictions franchise rights have been considered as easements in the land and a return allowed upon the value of these easements. He agreed with the previous speaker that franchise taxes should not be levied unless it be as a privilege tax.

Alfred Bettman, attorney of Cincinnati, discussed the matter from the point of view of different kinds of franchises, such as limited-term, perpetual and indeterminate franchises. With indeterminate or limited franchises under regulation, no value exists, but for condemnation purposes there may be such a value.

Harry Barker quoted from the opinion of Justice Miller in the Passaic gas case, in which a franchise was regarded as property which must be protected by the court, but property which is not used and useful in the public service and hence should not be included in a valuation for rate-making.

Going value was discussed at the session on Friday afternoon, which was presided over by Morris Schaff, Massachusetts commissioner. In an opening address General Schaff alluded to the pioneer work in regulation which has been done in Massachusetts. The obligation of the consumer was recognized to pay for the expenses of operation and depreciation, to make a generous return on the investment and to provide a surplus for contingencies. The question of capitalization of earning power was never raised there. It was necessary to consider how much of the present value of any utility was contributed by the stockholders, how much by the customers and how much by the state or social factors. In confiscation proceedings he urged that a distinction be drawn between the conditions of competition and monopoly. He hoped that

we would not be confronted with another Dred Scott decision in which the property in slaves was put on a par with property of other kinds.

An address was then made by R. C. Wood, New York commissioner, in which he discussed the objects and the value of regulation.

A paper was then read by Clifford Thorne, chairman of the Iowa Railroad Commission, entitled "Going Value as an Element in Fair Value." He discussed the various meanings which have been given to the term "going value" and the proper treatment of early losses and profits. He dealt at some length with the Des Moines gas case, where the principal point involved was a proper allowance for an established business, and in which the Supreme Court decided that this element had been properly considered in making an allowance for the value of the plant in successful operation. A plant which is not in successful operation does not have a value equal to the reproduction cost less depreciation. Regarding early development costs, he considered whether these should be regarded as operating expenses, or be capitalized, or merely be considered in determining the proper rate of return. He favored the latter method. Unless there is actual proof of early losses no allowance should be made for them. He questioned whether losses arising through conditions of competition should be regarded as a part of preliminary expense. After a period of nonregulation he thought utility companies should be estopped from bringing up the question of early losses.

Addresses at this session were also made by J. L. Bristow, commissioner of Kansas and former United States Senator; A. M. Fox, of Detroit; and William J. Hagenah, of Chicago. Mr. Bristow claimed that the depreciation which securities had undergone in recent years is not due so much to an inadequate rate of return as to mismanagement by utility officials. He cited the case of one railroad which had gone into the hands of a receiver during the year in which its gross receipts were the greatest. He also pointed out the absurdity of the two claims for capitalization of both excess earnings and early losses.

Mr. Fox discussed the proper treatment of intangible values under the headings of overhead expenses, developing an organization, and going value. He considered the first two elements proper subjects for capitalization but going value should not be considered for rate-making purposes.

Mr. Hagenah advocated an allowance for going value in rate cases to be determined from actual records of operation. Early losses are evidences of cost, not of value.

Depreciation.

Depreciation received attention at the session on Friday morning. Papers were presented by J. H. Goetz, counsel for the New York Public Service Commission, First District, entitled "Court Decisions on Depreciation" and by Halford Erickson, of the Wisconsin Railroad Commission, entitled "Relation of Depreciation to Fair Value."

Mr. Goetz pointed out that the courts had been somewhat contradictory in their decisions on this subject, which at present is somewhat hazy. He classified these decisions with respect to their different bearings upon the subject and pointed out that tax cases have no bearing upon the application of the subject in rate cases.

Mr. Erickson dealt with appraisals and the meaning of "fair value." He considered the different elements in depreciation, pointing out that wear and general decay or aging were physical elements, whereas inadequacy and obsolescence are social elements. He favored allowance for depreciation in equal annual installments and pointed out that adequate service is bound up with a proper allowance for depreciation and proper care of the depreciation reserve. The unused portion of the depreciation reserve should earn interest to be added to this reserve and relieve the burden on the consumers. It is both legal and ethical to permit a return to be earned upon the cost plus the reserve fund minus depreciation. Whether the cost should be original cost or reproduction cost is another question. He discussed cases in which depreciation reserves had not been accumulated, and said that if rates had been sufficient to create such a reserve, cost less depreciation should be taken as fair value, but where income had been insufficient to create a reserve fund there should be no deduction from the cost for depreciation. A study of the balance in the reserve funds of actual utilities shows that this varies in amount from 10 to 50 per cent of the value of the plant.

This subject was discussed by James E. Allison, of St. Louis, and John Bauer, of Cornell University. Mr. Allison objected to the consideration of accrued rather than actual depreciation on account of its speculative nature and the inapplicability of average life data to any particular case. Life depends upon use and maintenance, and also upon obsolescence and inadequacy. Even if accurate figures for life were available for the individual parts of a plant, there is no such thing as a composite life since with proper renewals the life of the entire plant is indefinite. Depreciation of a plant is prevented when proper replacements are made and the funds for this purpose should be called replacement funds. Mr. Erickson regarded the fund as a part purchase of the plant by its customers. This is harmless if both parties are willing to regard it in this light, but it has nothing to do with the present value of the plant, and may work injury when applied to the past since it amounts to a regulation of past profits.

Professor Bauer said that if actual cost rather than reproduction cost were considered it would not be necessary to make deductions from the valuation for depreciation. He favored appraisals based on actual prices at the time of construction and pointed out the desirability of some definite method which would be to a certain extent automatic and represent a definite policy. In the future valuation should be based on actual cost. For utilities already operating a valuation should be determined for the present time and the curtain drawn upon the past. Whether depreciation shall be deducted from the valuation should be a matter of general policy and it cannot be expected to do justice in every indivdual case.

The Future in Public Utilities.

At the session on Friday evening which followed a dinner, President Charles R. Van Hise of the University of Wisconsin presided.

Charles A. Prouty, of the Interstate Commerce Commission, and William D. Kerr, of Chicago, made addresses on "Constitutional Protection in Valuation." Mr. Prouty said it was the function of commissions to regulate utilities but not to destroy them, and the courts stepped in whenever the question arose of whether utility corporations were being deprived of their property. The commissions, however, are supreme in their rulings as to rates, subject only to the condition that a fair return must be permitted on a fair valuation.

Mr. Kerr pointed out that nearly all of the various points of view in regard to valuation can find some authority in past court decisions. He interpreted Supreme Court rulings to mean that franchise values cannot be included for rate-making purposes. There are various restrictions to the property rights of a public utility corporation as compared with that of a private individual.

Newton D. Baker, mayor of Cleveland, regarded commission regulation as a barrier to public ownership of utilities.

John H. Gray, of the University of Minnesota, spoke on "Opinion Testimony." He discussed the rules of evidence and the evolution of the functions of juries, witnesses and judge. He showed that opinion is not evidence and that expert testimony is too often biased by business affiliations. Restrictions should be enforced to secure real experts, fewer in number, less biased, and at reduced cost, and they should preferably act merely as advisers of the court.

The last speaker was Milo R. Maltbie. Among other points, he emphasized that depreciation funds should be held in trust for that purpose and never distributed, or the public will in the future raise objection to liberal depreciation allowance.

TEMPERATURE OF MICA INSULATION.

Monthly Meeting of the American Institute of Electrical Engineers.

The 315th meeting of the American Institute of Electrical Engineers, held in New York City on the evening of November 12, with Vice-President N. W. Storer in the chair, was devoted to a consideration of the temperatures to which mica insulation may be subjected in electrical machines. F. D. Newbury read a paper entitled "Experimental Data Concerning the Safe Operating Temperature for Mica Armature-Coil Insulation." This paper gave the results of tests made upon a 3,750-kilowatt alternating-current generator installed at Niagara Falls, which has been in operation for 20 years. The insulation of the armature coils of this machine consisted of mica wound around the copper bars with cambric for a wrapper. This insulation is still in good condition although it has been subjected for long periods to temperatures up to and exceeding 200 degrees centigrade.

The Standardization Rules of the American Institute limit to 125 degrees the temperature to which insulation of this class should be subjected, except in cases of special guarantees by the manufacturer. As a result of this test Mr. Newbury showed that under the conditions of operation of this generator temperatures up to 200 degrees were not deleterious and he expressed the opinion that 150 degrees was a conservative limit under any conditions whatsoever.

In the discussion which followed this paper nearly all of those who spoke agreed with Mr. Newbury that this temperature limit should be raised in the Standardization Rules. Those who participated in the discussion were Philip Torchio, W. J. Foster, H. P. Wood, B. A. Behrend, C. F. Scott, H. F. T. Erben, C. E. Skinner, John B. Fisken, Paul M. Lincoln, F. W. Peek, Jr., L. T. Robinson, T. E. Fowler, W. L. Waters and E. W. Stevenson.

Mr. Wood was the only one to object to raising the temperature limit. Professor Scott, Mr. Lincoln and Mr. Skinner told of the early history of the Niagara installation. At the time the generator was built and during the early years of operation no one had any idea of the actual temperatures in the interior of the machine.

Several of the speakers pointed out that it would not be wise to exceed 200 degrees as a permissible operating temperature because the binding material used in connection with the mica would then undergo disintegration, even though the mica itself would not be affected until a much higher temperature was reached.

With respect to the general use of mica for insulating purposes, it was pointed out by Mr. Erben and others that for many uses mica had no advantage over other insulating materials and on account of its added expense would not be advisable. Mr. Foster told of keeping machines at 200 degrees operating temperature for several weeks without any deterioration. Mica will meet with a much wider scope of application if 150 degrees be regularly permitted.

Mr. Behrend pointed out that it was well known by designers and others that insulation had been subjected to higher temperatures than generally supposed for years and that it was much better for the entire profession to be acquainted with the actual facts.

Mr. Torchio pointed out the advantage of being able to run machines at higher temperatures for periods of overload and pointed out the peculiar characteristics of the Niagara machine which made it less susceptible to danger than might be the case in other models. He described two machines recently purchased by the United Electric Light & Power Company to supply single-phase current to the New York, New Haven & Hartford Railroad Company, in which an operating temperature of 150 degrees was accepted in the specifications. These machines have a capacity of 20,000 kilowatts at 25 cycles and 6,600 volts. On account of the load conditions the machines will not operate continuously at the maximum temperature. These machines are the largest of their kind in existence.

In closing the discussion Mr. Newbury said that the same type of insulation had been applied to small copper conductors with satisfactory results. Linear expansion due to high temperatures does not produce any difficulty, especially as the hot spots are local and the average temperature much lower. Temperature, however, is not the only limitation to rating.

Chile Telephone Company to Place Lines Underground.

The Chile Telephone Company is to begin work within a few months on changing its system of wires in Valparaiso, Chile, from overhead to the underground system. At present all of the telephone wires in Valparaiso are overhead wires. In laying the wires underground care will be taken to follow the lines of streets not paved with asphalt. The general manager for Chile of the Chile Telephone Company is William Johnston, Calle San Martin 50, Santiago. The local manager is Señor Ernesto Varas, Avenida del Brazil 54, Valparaiso.

Tremendous Demand for Electrical Prosperity Week Sales Helps.

One of the leading manufacturers has announced that through the medium of Electrical Prosperity Week campaign, he has sold nearly $100,000 worth of goods. Neil C. Hurley, of the Hurley Machine Company, makes this statement. Other prominent manufacturers and jobbers have stated that central stations, dealers and contractors everywhere are taking adavantage of the great campaign to sell electrical goods; even the department stores are stocking up preparatory to the Week and to the Christmas sales campaign.

That the campaign is the greatest movement in trade history is evidenced by the tremendous demand for the Electrical Prosperity Week sales helps. The Society has been deluged with orders for material from all parts of the country. Not only are the large cities celebrating the big affair but even the smaller hamlets have taken it up. It is nation-wide.

Leading sales and advertising experts in co-operation with the Society for Electrical Development at a spring meeting decided upon the quantities of material to be ordered. For example, originally it was thought that 2,500 car cards would meet the demands. There are 58,000 available cars in the country and up to November 12, over 23,000 car cards had been ordered. The first order was for 10,000 window cards. The Society has shipped 50,000 to date. Even the 5,000,000 poster stamps have not been enough. Probably 10,000 automobiles and wagons will carry the muslin signs.

The telephone companies everywhere are co-operating with the electrical interests in mailing the interesting little folder: "How Much Better the World is Since Electricity Became your Servant." Two million copies of this folder were printed by the Society. The telephone companies will mail nearly 600,000 to their subscribers. The Western Electric Company greatly aided the electrical interests in arranging for this co-operation. Many of the Western Union offices will display the window lithograph in their windows during the Big Week.

By an arrangement with the Society, *Collier's Weekly* had 25,000 copies of an advance advertising edition of *Collier's* printed. This issue has special edition cover showing a grandmotherly lady cooking a Thanksgiving turkey in an electric oven. It contains all of the ads to be run in the November 27 issue and gives the story of the Week and what is being done everywhere. Perhaps this was one of the biggest publicity strokes of the Society's campaign.

Collier's Electrical Number will be on the streets November 23. This big

magazine will advertise its special issue in electrical pages of newspapers, in street cars, on billboards and at the many electrical shows. The circulation of this issue will probably be considerably over a million.

Saturday Evening Post will carry a large number of electrical advertisements. The *National Food Magazine* and the *Scientific American* have special electrical numbers. In the aggregate, fully ten million people will see these ads.

The "How To" booklets issued by the Society have been largely instrumental in tying the sales end of the campaign into the celebration. These booklets will be valuable long after the campaign is over. They are free to everyone.

The big Week is nearly here and it is quite apparent now that it will be a tremendous success. It is without question the greatest sales campaign in the world's history.

Electrical Prosperity Week Meetings.

Members of the staff of the Society for Electrical Development have recently addressed several large meetings in the interest of the big campaign.

Harry W. Alexander, director of publicity, spoke at a meeting of electrical men in Washington, November 9. He told of the work of the electrical interests everywhere and what was being accomplished. Considerable enthusiasm was aroused and the Washington interests voted to get back of the campaign with might and main.

John McLaughlin, commercial manager of the Potomac Electric Power Company, presided and pledged the support of his company. Clarence P. King, president of the company, made some illuminating remarks on the great worth of such a campaign. An Executive Committee was appointed to take charge of the Big Week. It consists of E. C. Graham, O. R. Evans, John R. Galloway, John J. Bartram, C. Phillips Hill, H. R. Carroll, and A. Stephan. These men will appoint other Washington men to assist them.

Later the same evening Mr. Graham and Mr. Alexander spoke at a meeting of the Washington Chamber of Commerce. This body endorsed the movement. On November 10 Mr. Alexander addressed a meeting of the Retail Merchants of Washington. Most of those present offered to make special window displays during the Week.

Baltimore was a little late in getting started but all are working now for the success of the Week in that city. Robert Lee, publicity manager of the United Railways and Electric Company, was appointed director of the campaign.

The Executive Committee consists of Douglas Burnett, Walter Moulton, H. L. Lemmert, William L. Modell, S. B. Prather, and Eugent I. Rosenfeld. Special attention will be paid to window displays by electrical and non-electrical interests.

Mr. Alexander addressed the Jovians and associated electrical interests at a meeting held November 11, at Hotel Emerson in Baltimore.

George W. Hill, of the field co-operative staff of the Society for Electrical Development, is making an extensive southern trip in the interests of the campaign and in planning sales campaigns.

Meeting of Electric Power Club.

The Electric Power Club held a meeting at Hot Springs, Va., Nov. 8, 9 and 10.

It was one of the best meetings yet held and was attended by 47 men representing 20 companies.

The constitution was amended so as to include as members manufacturers of transformers and industrial control apparatus. This opens up a very large field for standardization which will prove as valuable to both the manufacturers and users as the standardization work already done on electric motors and generators. Five companies manufacturing this class of apparatus were elected to membership, making the membership 34 companies in the electrical industry.

In the work of standardization of motors and generators, a number of changes in the existing commercial ratings were made to bring them within the limits established by the new rules of the American Institute of Electrical Engineers. The allowable variation in voltage at which motors will operate successfully was fixed at 10 per cent above or below the rated voltage. It was recognized, however, that such a variation did not necessarily mean that the motor would operate within the guarantees given for operation at normal voltage. The starting torque for continuous-duty polyphase induction motors with full voltage applied was standardized at not less than 150 per cent of full-load torque for two, four and six-pole motors, 125 per cent for eight, ten and twelve-pole motors, and 100 per cent for fourteen-pole motors. The maximum torque for such machines shall not be less than 200 per cent of full-load torque.

For direct-current motors, the variation in speed from full load cold to full load hot was fixed as not to exceed 10 per cent, based on the full-load speed hot.

There was considerable discussion as to the proper basis of rating for continuous-duty motors and generators used for general purposes, as distinguished from special-application machines used where the conditions of service and magnitude of load are definitely fixed and known beyond question. An illustration is a motor direct-connected to a blower where the maximum load is definitely known and cannot be exceeded. The sentiment expressed at the meeting indicated that for general purposes the Electric Power Club was decidedly in favor of making no change in the present basis of rating, namely of 40 degrees centigrade at full rated load with a 25-per-cent overload temperature guarantee for two hours, but that in the case of special-application machines a higher temperature rise, but still within the limits established by American Institute of Electrical Engineers, and with no overload temperature guarantee, might be justified.

Large Electric Hoist for Montana Mine.

The hoist now in course of installation on the Granite mountain shaft of the North Butte Mining Company is the first large electrically driven hoisting engine to be installed in Montana. It is, in fact, the largest on the two American continents, and ranks with the very largest installations that have ever been made. On this installation particular attention has been given to economy of operation, reliability and "safety first."

The electrical equipment on the hoist is designed to handle seven tons of ore per trip. The ordinary operating rope speed is 2,700 feet per minute, but arrangements are made so that the speed ca n be increased up to 3,000 feet per minute. The equipment is designed to handle hoisting from various vertical depths down to 4,000 feet, and the cycles of operation have been chosen to give, approximately, capacities from various levels as follows:

Three hundred tons per hour from the 2,000-foot level; 250 tons per hour from the 3,000-foot level; 200 tons per hour from the 4,000-foot level.

The hoist itself has cylindrical drums 12 feet in diameter and the rope to be used is one and five-eighths inch plow steel cable.

To drive this hoist with an electric motor and still not draw excessive peaks of power from the electric power line, a combination of apparatus known as the Ilgner system was decided upon. In this system a direct-current motor is used on the hoist and supplied with power from a direct-current generator forming part of a motor-generator set. The motor of this motor-generator set is supplied with power from the electric supply line. Mounted on the shaft of the motor-generator set is a flywheel whose duty it is to equalize the amount

of power drawn by the alternating-current motor from the power line.

The power required to accelerate the hoist and its load from standstill to the running speed of 2,700 feet per minute depends of course on the rate of acceleration. In order to obtain the capacity desired from this hoist it was necessary to use a very high rate of acceleration, in fact, from standstill to full speed in about 15 seconds. This means that the power required to accelerate is very greatly in excess of the power required to do the hoisting once full speed is attained. The power required for hoisting averages about 1,500 horsepower, but to accelerate the equipment and the load requires peaks varying from 3,500 to 4,300 horsepower.

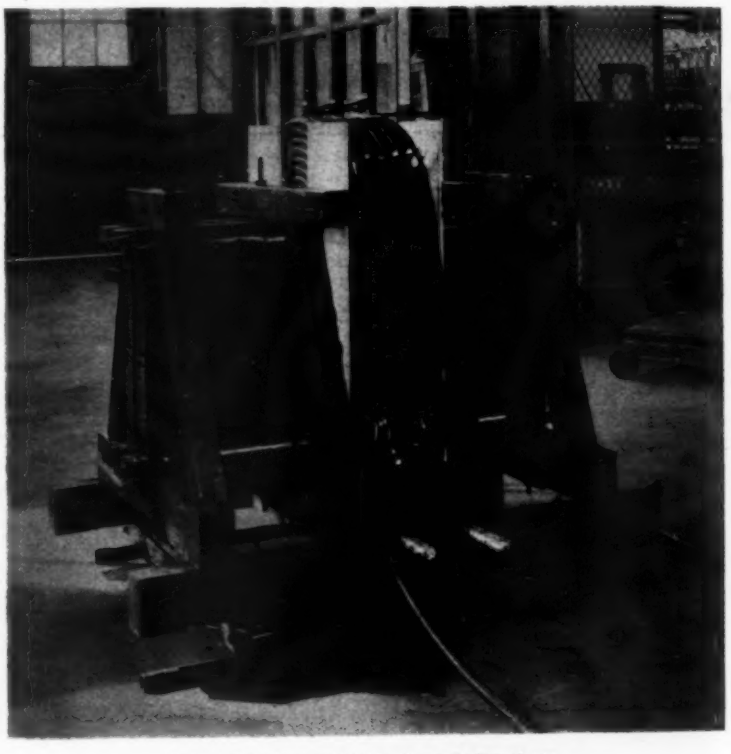
The flywheel on the motor-generator set supplies the extra energy (that is, the amount of energy above the average) required for acceleration.

The sizes of the electrical equipment involved in this installation are as follows: The direct-current hoist motor has a nominal continuous rating of 1,850 horsepower. Hoist motors not being operated continuously are usually given what is termed an intermittent rating, and this particular hoist motor has an intermittent rating of 2,750 horsepower. It is really big enough to pull 4,500 horsepower for a short period of time and is guaranteed to do so.

The generator of the motor-generator set has a rating of 1,500 kilowatts, and can deliver 3,750 kilowatts without trouble. The driving motor is 1,400 horsepower. The flywheel is 12 feet in diameter, weighs 50 tons, and the whole set runs at speeds varying from 400 to 500 revolutions per minute, according to the action of the slip regulator.

The peripheral speed of the flywheel will be as high as 19,000 feet per minute. Naturally this causes some stress in the material of which the wheel is constructed. In order to prevent any possibility of a flaw in the wheel, it is assembled out of sheets of rolled steel plate, each sheet being one-half inch in thickness and cut to fit the wheel. These various plates are being assembled together to a total thickness of 21.5 inches and then riveted.

Naturally a flywheel of this size, presenting such a great area for air friction and running at such a high speed, will cause considerable windage. Windage is energy wasted in uselessly stirring up air, and, in order to reduce it and thus increase the economy of the set, the entire surface of the flywheel is very carefully finished. All rivets are countersunk flush with the surface. The entire wheel is carefully cut and finally polished and lacquered, so that it will present as smooth a surface to the air as possible, and thus reduce friction. Further, the amount of air that could possibly be moved by contact with the wheel is reduced by totally inclosing the wheel in a short steel case carefully finished on the inside and fitting as closely as possible about the flywheel. Tests indicated that the friction and windage losses running the flywheel in the open air would be between 80 and 100 horsepower. By inclosing the wheel in a properly designed cover, these losses could be reduced to something like 50 horsepower. Excluding the air from the cover did not seem to reduce the losses by more than 12 or 15 horsepower, which saving in power would hardly pay for the application of the necessary water-sealed glands, air pump and changes in case construction to resist the external atmospheric pressure.



Large Reactance Coil Built in Laboratory.

Laboratory-Built Reactance of Large Capacity.

A 1,000-kilovolt-ampere reactance, for use in cable testing at the Boston Edison Company's Walpole substation, was recently constructed in the laboratory of the company. It was calculated by Prof. C. A. Adams of Harvard that a reactance of about 1.4 ohms should be used in the low-tension circuit to insure a good wave form in the high-tension circuit.

A transformer having the necessary core was found in stock, the calculation calling for a core of 140 square inches cross section and about 56 turns of wire in the winding around the core.

The transformer, which was a 200-kilowatt unit of the air-blast type, was dismantled and about 15,000 iron laminations taken out and reassembled on a strong hard-pine base.

The laminations were built up into two slabs, each 3.5 inches thick, 2 feet high and 4 feet long, with a 1.25-inch space between them for ventilation. The weight of the core thus formed was about a ton, and of the assembled apparatus about 2.75 tons.

The core was wound with 500 feet of 500,000 circular-mil flexible cable in pancake coils of eight turns each, with air ducts between the coils. The whole reactance was rigidly braced to withstand structural, shipping and electro-magnetic strains.

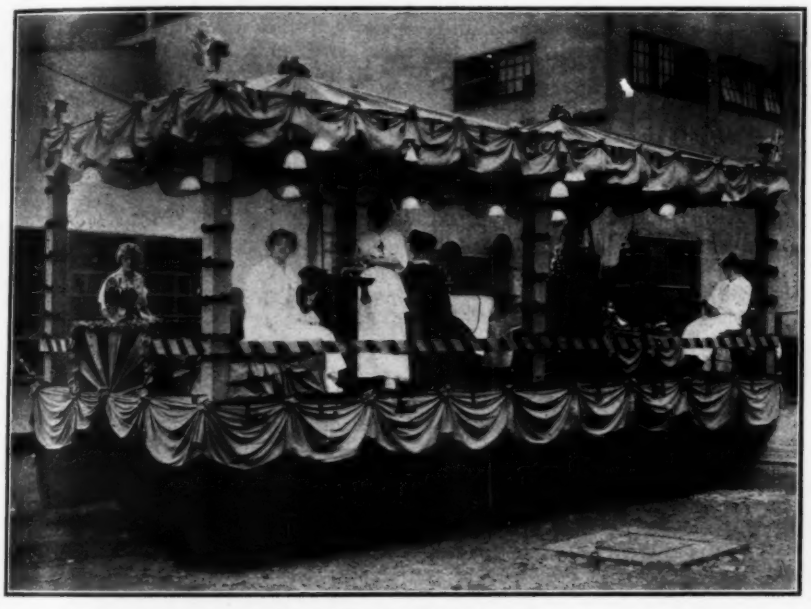
The instrument was insulated for 2,300 volts and designed to carry about 700 amperes. The characteristic curve was found to be a straight line throughout its current range.

In the laboratory try-out tests direct current, of 700 amperes, was sent through the winding, causing the iron coil to become a very powerful electro-magnet. A 20-inch screwdriver, with its point sticking to the end of the coil, would become tangent to the leakage lines of magnetic flux, though the axis of the screwdriver was stationary in the air at an angle with the floor. At the Walpole substation, when alternating-current energy was flowing in the winding, bolts and nails 1 to 6 inches distant from the core would become so hot as slightly to char the wooden frame. The heating was caused by eddy currents induced by leakage lines of magnetic flux passing through the metal objects.

A Prize-Winning Electric Float.

The advantages of the use of electricity in the modern household were very attractively and convincingly displayed in the float shown in the accompanying illustration, which was entered by the Westinghouse Electric & Manufacturing Company, in the parade held during the recent celebration by Wilmerding, Pa., of its twenty-fifth anniversary. The parade, which was composed of fraternal and commercial organizations and floats from industrial organizations in the vicinity, was the most elaborate ever attempted in the Turtle Creek Valley neighborhood.

Owing to the fact that the parade was held at night, the Westinghouse Electric float was the center of attraction, the profuse illumination afforded by the 14 60-watt lamps placed around the sides and two 100-watt lamps hung from the center adding greatly to its attractiveness.



Prize-Winning Float.

The float represented two scenes, the front one being that of a dining room in which an electrically prepared dinner was being served to a number of young ladies. By means of table stoves, coffee percolators and other devices, dinner was prepared right at the table. Two of the ladies stood up and popped corn over an electric stove and threw it out among the spectators, all the way along the route of the parade.

In the rear portion was shown a laundry scene, emphasizing the difference between the "old" and the "new" way of washing. On one side was an electric washing machine, busily washing the clothes, while the young lady in her good clothes was sitting comfortably by reading a book, giving the machine only an occasional glance. On the opposite side was an old negro "mammy" bending over an old-fashioned back-breaking washtub. Appropriately worded placards explained the different scenes. In this part of the float there was also a table on which were placed several different electrical labor-saving devices. A "Cozy Glow" radiator, the soft light from which added much to the attractiveness of the scene, was also included. An electric vacuum cleaner set opposite an old-fashioned long-handled broom served further to emphasize the advance in household efficiency.

The float was built on the chassis of a five-ton automobile truck. Beams were bolted across the frame and other pieces, running lengthwise, were bolted to these. This framework served as the base for the floor and the superstructure. At the corners and midpoints of the structure, columns were fastened to the base. Bracings for the tops of the columns were secured by means of a skeleton gable framework. These gables were shallow and formed the support for the roof, which was covered with bunting as was the main body of the truck. The color scheme was a combination of orange and black, colors of the city of Pittsburgh.

Oscillating fans with streamers attached were placed on top of the four columns, but this did not prove a success, because of wind pressure of the moving float and also on account of the overhead obstructions met with en route. Current for the operation of lights and other devices was obtained from a 300-ampere-hour storage battery placed under the flooring.

MILLION-VOLT TRANSFORMER TO BE DEMONSTRATED AT THE PANAMA-PACIFIC EXPOSITION.

By Neill Willson.

A big frame building 30 by 90 feet in size and three stories high, has been constructed by the Panama-Pacific International Exposition at San Francisco to house a 60-cycle, million-volt transformer—the biggest ever built.

The structure stands in the vacant lot behind Machinery Palace. It draws its current from the adjacent power plant maintained by the Exposition in the Pacific Gas and Electric Building. In addition to the structure which was built to house the transformer, an immense metal pole and connecting wires were arranged outside, so that the public can have an opportunity to view demonstrations.

Million-Volt Transformer.

For a long time the transformer has been in process of manufacture. Part of the funds were donated by the Smithsonian Institution and part by the Exposition.

The installation of the transformer was completed November 1. It was designed and built in the laboratory of C. H. Thordarson, of Chicago, at a cost of $30,000. This cost includes the specially made machinery for winding the low and high-tension coils and the insulating tube.

The transformer is installed in a specially designed building erected by the Exposition at a cost of $6,000. There are no nails used in the construction, the structure being held together by iron bolts which run parallel to the high-potential wires to avoid the danger of fire from the electric static stress. It has the appearance of a large Zeppelin hangar, as both ends are left open for ample clearance of

the high-voltage wires that lead to the structures outside of the building.

The transformer is submerged in 225 barrels of oil in a specially designed cement pit with metal lining. The air surface at the oil line measures 16 by 18 feet. This high-grade insulating oil was loaned by the Union Oil Company of California to the Exposition.

The weight of the transformer is approximately 30,000 pounds, and it is made up of 26,000 pieces of paper, fiber, aluminum, copper, steel and iron, and designed to develop 1,000 kilowatts at 60 cycles.

The low-tension coils of this transformer are wound to receive 2,200 volts and are made up of 122 coils arranged in multiple-series, the coils being bridged in pairs across the 2,200-volt terminals. This allows for a neutral tap which is grounded to the transformer frame.

The paper tube which insulates the primary and secondary coils weighs over 2,000 pounds.

The million-volt winding is made up of 190 coils, each coil being wound for 5,000 volts, equally spaced, and wound with flat aluminum, 8-mil 0.1-ampere conductor insulated by three layers of paper. All coils are connected in series, with one end grounded.

There are 400 miles of paper, aluminum and copper used in the construction of the coils and paper tube, 90 miles of aluminum and 270 miles of paper being used in winding the million-volt coil.

Municipality Takes Over Berlin Plant.

The City of Berlin, Germany, has purchased the power stations in that city formerly owned by the Berlin Electricity Works, which is closely related to the Allgemeine Elektricitäts Gesellschaft. The price is about $31,000,000.

New York Electrical Society.

There was a large attendance at the visiting meeting of the New York Electrical Society, at the Equitable Building, 120 Broadway, New York City, on November 13. Twenty-three members were elected. After luncheon, C. T. Coley, operating manager of the building, gave a most interesting address on its leading features. The members were then conducted over the building.

Mica mining in the United States commenced in 1803 with the opening of the Ruggles mine, Grafton County, New Hampshire, and until mica mining began in North Carolina, about 1867, New Hampshire furnished the mica output of the United States.

LETTER TO THE EDITOR.

Some Law Regarding Contracts.

To the Editor:

Relative to a recent discussion regarding the law of acceptances and in particular to the issue in which one made an objection that the sender of a letter has the right to withdraw same before its delivery.

I am not a lawyer, but it seems to me that your answer is in error in principle. It is stated that B, by withdrawing his reply before delivery, has acted as if he ran after the messenger of A and snatched his message from him. Is the United States Post Office department the messenger of A exclusively? Is it not the common messenger of either and that until delivery is made of any message, to the party addressed, is it not the messenger of the party sending same? If this is correct, B did not snatch the message from A's messenger, but from his own. If this is true he is taking the message from himself and which he has the right to do before he has offered it to A.

It is stated in the same reply that if A had discovered that B had accepted A's letter at some later time, even though he had not received the written acceptance, he could claim same. As I gather it anyone has the right to change his mind before another has taken action on one mind phase as *stated* by the maker. If this is correct B can change his mind as many times as he pleases before any action is taken by A. This action, however, is assumed to be taken immediately upon receipt of any word by A from B. What is the law in this?

W. M. Price.

Seattle, Wash., October 14, 1915.

[Answer—Where A sends to B by mail, an offer, and B *by mail*, has sent an acceptance, the contract, as I stated before, is complete, and nothing which can be done by either party subsequently, can get away from it or away from the legal obligations that arise under it. Where the offer is sent by A by mail, the law holds the mail to be A's messenger, rather than B's—though, of course, in a sense the mail is the common messenger—and when the answer is delivered to the mail by B, it is as if it had been delivered to A himself. At this minute the contract is complete. Getting B's message of acceptance out of the mails would not change the situation because under the law it is technically already in A's hands.

Elton J. Buckley.]

Philadelphia, November 15.

Tampa, Fla., has passed an ordinance requiring the examination of electricians.

BOOK REVIEWS.

"Electrical Measurements and Meter Testing." By David P. Moreton. Chicago: Frederick J. Drake and Company. Cloth or leather, 328 pages (4x6½ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $1.00 in cloth; $1.50 in full leather.

This volume has been prepared especially with the requirements of the practical man in mind. The first five chapters are devoted to the general principles of electricity and the following eight treat of methods of measurement. Numerous examples are given with solutions to elucidate the principles. The construction and operation, as well as the testing, of watt-hour meters is fully treated. The volume seems admirably suited to the class of readers for whom it is written.

"Universal Methods for Computing the Speed of a Telegraphic Message Sent by Automatic Transmitter or Hand Key." By J. Rymer-Jones. Published by the author. Paper, 22 pages (8½x13 inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $1.25.

The personal work of the author which is presented here will interest only the technical worker in the telegraphic field. The author has developed a method for determining the speed of working submarine cables and has applied it to both manual and automatic transmission. He has endeavored to show that whatever may be the number of elements per word in the various codes, these can be converted into an equivalent standard word from which a speed constant may be determined.

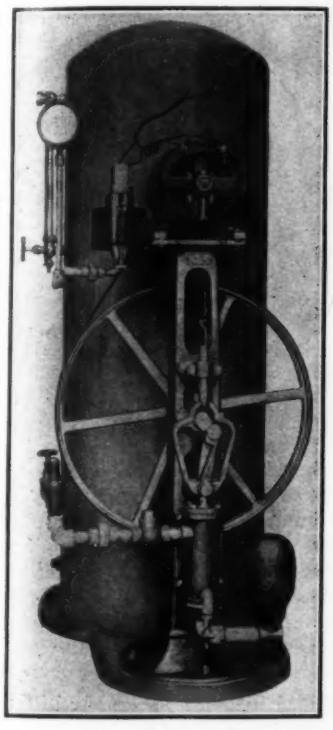
"Rubber Machinery." By Henry C. Pearson. New York: The India Rubber World. Cloth, 419 pages (6x9 inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc. for $6.00.

The author of this volume is the editor of *The India Rubber World*, and has no doubt had unusual facilities for collecting information upon this subject. The various processes through which rubber is carried from the collection of the crude product until manufactured into commercial merchandise are described, as well as the methods of reclaiming old rubber. Many illustrations of the machinery involved are given, including all important machines. The book should prove valuable to anyone who wishes to familiarize himself with this industrial process. The application of motor drive to rubber machinery is mentioned, as well as the use of electric energy for devulcanizers, ovens, and other electrically heated apparatus, as well as in controlling devices. The book is the best we have seen on this subject.

New Electrical and Mechanical Appliances

Columbiana Electrically Operated Pump.

A new electrically operated water pump for residence service has recently been marketed by the Columbiana Pump Company, Columbiana, O. It is of the double-acting cylinder type and has a capacity of 125 gallons per hour when operating at a speed of 120 to 135 revolutions per minute. The plunger is all of brass and the cylinder is brass lined, minimizing corrosion and insuring long life. The air intake



Electrically Driven Pump.

can be regulated to take any desired proportion of air and water at each stroke, or the air can be shut off entirely. To insure quiet operation the vacuum chamber is placed on the intake side. The tank can be furnished in sizes of either 50 or 100 gallons. It is electrically welded, heavily galvanized and absolutely air-tight and rustproof.

Standard Westinghouse one-sixth-horsepower small motors, type CA alternating current and type CD direct current, are used to operate the pump. A spring idler maintains the flat belt at the proper tension at all times and insures quiet operation. Automatic switches can be set to start and stop the motor at predetermined pressures.

New Six-Ampere Pull Switches.

Pull switches to have the widest application must be of sufficient capacity to control entire lighting circuits as well as groups of high-candlepower gas-filled lamps. In other words, for some time a switch of six amperes, instead of three amperes, capacity was needed.

The accompanying illustrations show two styles of the new C-H six-ampere pull switches put on the market by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. These are claimed to be the only six-ampere pull

Pendent and Threaded-Cap Pull Switches.

switches on the market and the price is the same as for the others.

A new adaptation of the ingenious C-H quick-action, high-capacity switch mechanism is used, which makes it possible to handle easily the larger currents. These switches are made in ceiling, pendent, and threaded-cap types, the shells being interchangeable with C-H brass-shell sockets. The pendent type has the approved cord-strain relief used in C-H pendent sockets, which makes it unnecessary to knot the cord. Ten feet of black pull cord is furnished with each switch.

United States Consul E. A. Wakefield reports that American transformers have been installed in the new addition to the municipal electric-light plant at Port Elizabeth, South Africa.

Reflector for Industrial Lighting with Gas-Filled Tungsten Lamps.

Since the advent of the gas-filled tungsten lamp it has usually been considered necessary to mount these very brilliant lamps in special fixtures completely inclosing the lamp, this being true whether the lamps are used outdoors or indoors. However, where the lighting units are mounted on a very high ceiling, and where maximum efficiency is necessary, such as in industrial plants, it is considered by some lighting interests to be good practice to use a very efficient form of reflector for the lamp, this being mounted in the same way as for vacuum-type tungsten lamps. Such an arrangement gives very good lighting for an energy consumption of only 0.5 watt per square foot, which is a very material reduction from what is ordinarily re-

Mirrored-Glass Reflector for Industrial Lighting.

quired in a well lighted industrial plant.

To meet the requirements of such an installation there has been placed on the market a new silver-plated mirror-type reflector designed particularly for use with the 200-watt gas-filled lamp. This reflector is of the beehive type and is provided with corrugations in two directions to break up the filament images or strictions which would otherwise be obtained due to the marked concentration of the light source. This reflector is quite deep and conceals the lamp entirely from the direct view along the ordinary horizontal lines of vision, although being open at the bottom it permits, of course, a full view of the very bright lamp if one looks upward at it directly. This reflector may also be used

with the 150-watt vacuum-type tungsten lamp, with which it also gives uniform light distribution, although of lower illumination intensity and at a lower efficiency.

This reflector is the first one of a complete line of industrial lighting reflectors for all sizes of gas-filled lamps which is being developed by the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, Ill.

Bell-Ringing, Toy and Sign-Lighting Transformers.

The great convenience and economy resulting from connecting all current-consuming devices to standard-voltage lighting circuits is producing greatly increased use of all kinds of electrical appliances. Since alternating current is becoming more and more universal for distributing circuits, it is coming to be a rapidly growing practice to connect even the very small low-voltage appliances, for which batteries were formerly used exclusively, to 110-volt circuits by means of appropriate transformers.

To meet the requirements of such service, the Packard Electric Company, Warren, O., has developed and placed on the

Fig. 1.—Porcelain-Inclosed Bell-Ringing Transformer.

marked a complete line of small transformers, of which the type shown in Fig. 1 is made for operating door bells, door openers, buzzers, annunciators and all classes of light signaling devices. The active elements are entirely inclosed in a porcelain case, which is filled with insulating compound. These transformers are furnished in three colors of porcelain: blue, brown and white. They are very small in size, light in weight and have an attractive appearance. They are practically indestructible. The primary is 110 volts and the secondary 11 volts.

The outfit shown in Fig. 2 is a heavy-

Fig. 2.—Heavy-Duty Bell-Ringing Transformer.

Fig. 3.—Fixed-Voltage Type Toy Transformer.

duty bell-ringing transformer and is adapted to the ringing of large gongs in school houses, factories, etc. This transformer is made along the same line as the one described above with the exception that the case is made of cast iron and is equipped with three voltages (6, 12 and 18) which makes it extremely flexible for operating bells installed on long or short circuits. It has a capacity of 50 watts and is designed to operate on any commercial frequency and is furnished for connecting 110 or 220-volt circuits.

For the operation of electrical toys, the transformers shown in Figs. 3 and 4 are furnished. Fig. 3 illustrates what is termed as the fixed-voltage or terminal

Fig. 4.—Master-Lever Type Toy Transformer.

type and is designed for operating the smaller class of toys. This device has a capacity of 50 watts, is housed in a cast-iron case and equipped with nine feet of flexible cord and attachment plug. Fig. 4 illustrates the master-lever type, which gives a voltage range of 0 to 30 volts by shifting the lever from contact to contact and also a permanent voltage of 6 volts for operating miniature lamps simultaneously with electrical toys. The cover is made of handsome blue-glazed porcelain equipped with nickeled hardware. The body is constructed of an aluminum spinning with satin finish and the base is

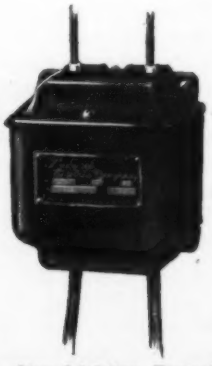


Fig. 5.—Sign-Lighting Transformer.

made of a malleable spider casting. These transformers have a capacity of 125 watts and are furnished for all commercial frequencies and voltages.

The transformer illustrated in Fig. 5 is adapted to tungsten-lamp sign lighting. The active element is housed in a cast-iron case, treated with two coats of baked enamel. Both primary and secondary terminal wires are porcelain-bushed and weatherproof. These transformers are furnished for all standard voltages and frequencies and in capacities ranging from 100 watts to 2,500 watts. The prime function of the transformer is to reduce the pressure from 110 or 220 volts to 11 volts, which allows the use of the 11-volt tungsten filament high-efficiency lamp in the electric sign.

Small Ammeters and Voltmeters for Battery Charging.

The development of the automobile has produced a great increase in the use of small storage batteries for igni-

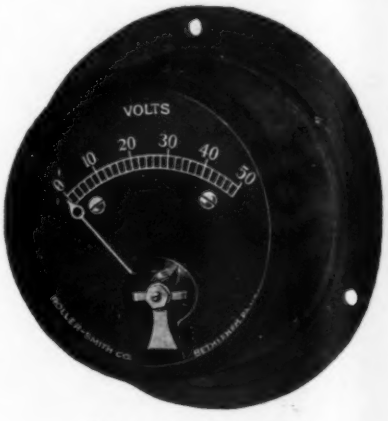


Fig. 1.—Small Voltmeter.

tion, lighting and starting the cars. For a great variety of other purposes also small batteries are coming into extensive use. Such batteries are liable to be neglected unless given as careful attention as the larger batteries usually receive. In order to safeguard such small batteries good instruments are required, by means of

Fig. 2.—Small Ammeter.

which the condition and output of the battery can be readily determined.

To meet these requirements the Roller-Smith Company, 203 Broadway, New York City, has recently added to its line of electrical instruments two new instruments, namely, an ammeter and voltmeter; these are known as "Junior Imps" and correspond in construction to the company's well known "Auto Imps" which have been very extensively used on electrically equipped gas cars. The new instruments are of the D'Arsonval type with permanent magnet and moving coil, which gives uniformity of scale division and dead beat indication. The permanent magnets are forged of tungsten steel; the entire moving element is very light but rigidly built. The dials are of etched metal with light indications on a black surface. The instrument case is made of heavy brass with black rubberoid finish; the case is sealed and is completely dustproof and moistureproof.

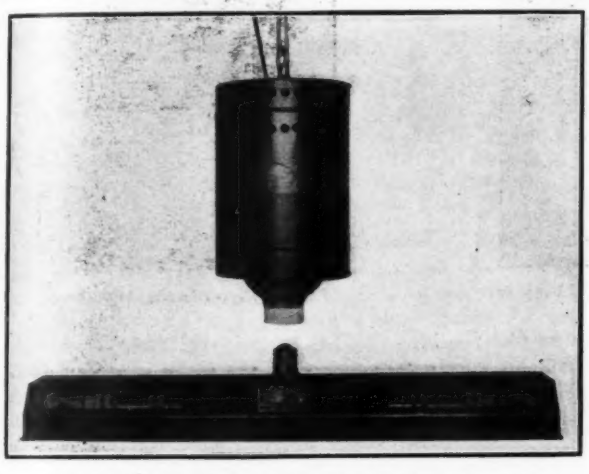


Fig. 1.—New Form of Moore Color-Matching Lamp with Transformer.

The instruments are very compact, having an outside diameter of the flange of only 3.5 inches. As a rule these instruments are furnished in the flange type as shown in the voltmeter, Fig. 1. The flush type, which is shown in Fig. 2, is also obtainable, however.

In range, the voltmeters are obtainable from 0-10 to 0-150. Ammeters are made either with single scale or with double scale having the zero point in the middle; their range is from 0-15 to 0-100. Although inexpensive, these instruments in every way are of high-class construction and are very serviceable for the purposes designed.

Automatic Telephony to be Used in Norway.

The Norwegian Government is planning for an automatic telephone exchange in Christiania. This will be the first of the kind in Norway.

New Form of Moore Color-Matching Lamps.

At a joint meeting of the Illuminating Engineering Society and the American Electrochemical Society, held in New York City on November 11, the new form of the Moore tube embodying a new principle was described in detail and illustrated by showing the difference in the color values of objects, such as dress goods, silks, meat and flowers, when viewed first solely by the light of a standard tungsten lamp and then by the new type of Moore light.

Elaborate spectrophotometric investigations have been made to prove that all articles when viewed solely by the light of the tube lamp have exactly the same shades of color as they possess when viewed by the light of a clear sky. It is stated that all dyers and other color experts agree that the standard light which they wish for color judging is that entering a window from a clear north-sky at an angle of about 45 degrees and preferably about mid-afternoon with a clear sun shining in the southwest.

The spectrophotometric curve of carbon-dioxide gas consists of a broken line with many jagged peaks, but an average of these peaks results in a smooth curve which gives a correct idea of the effective color characteristics so that it should be used to compare with the spectra of other sources. The effect of the banded character of the CO_2 spectrum, the tabulation of which consists of a broken line, was thoroughly investigated to determine its relation to the color-matching properties of the lamp.

The following samples of colored silk taken from the National Color Card of America, were selected to represent all parts of the spectrum, and were spectrophotometrically tested to determine what the actual color composition was: Violet, National blue, Yale blue, emerald, lemon, orange and scarlet.

The results of each of these tests was carefully plotted in the form of a curve, and a review of the data obtained in connection with these reflection curves shows that the irregularities in the CO_2 spectrum are absolutely without visible effect, and that they deviate only very slightly from north-sky values to which they are compared. It has been pointed out that if these north-sky values had all been taken at an angle of about 45 degrees, there would have been no detectable variation, and that therefore the color-matching values of the CO_2 spectrum were all that could be desired.

Fig. 1 shows an exterior view of this new color-matching unit. The straight tube lamp is contained in an elongated sheet-metal case, which is provided with a screw base similar to that used on the larger sizes of incandescent lamps. Instead of the lamp being fed CO_2 gas by means of an electromagnetic feed valve, it is generated automatically within the tube itself. Near each electrode is placed a small bulb about an inch long, containing calcium carbonate, from which emanates CO_2 gas when the resistance wires imbedded in it became heated to exactly the proper degree by reason of their being connected in shunt to the gas column. See Fig. 2. The gas column is 0.875 inch in diameter and one foot long, and appears as a solid bar of light of intense whiteness. The foot-candles available near the tube are over 200, thereby making this apparatus suitable for the very closest color discriminations. The degree of vacuum is automatically held within 0.001 of a millimeter, and the apparatus will stand wide line-voltage fluctuations without becoming disarranged in any way. The lamp takes about 240 watts.

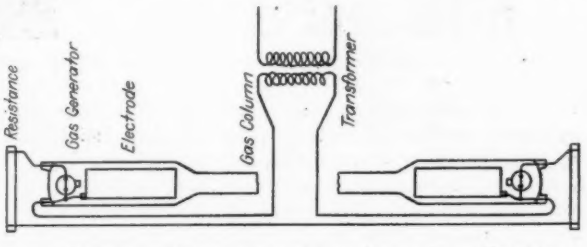


Fig. 2.—Diagram of Connections of New Moore Color-Matching Lamp.

Since light is the source of all color, it has been proposed that this new lamp receive official recognition from the International Conference on Electrical Units and Standards.

This new lamp is suitable for making absolutely correct color determinations, and is applicable to a very wide field, but is particularly useful in enabling the dye shops of the great textile industry to run night shifts. It is made by the Edison Lamp Works of General Electric Company, Harrison, N. J.

American Vacuum Cleaners in Canada.

A noticeable feature of the furniture-store window displays in Kingston, Ont., is the prominence given to vacuum cleaners of American make. With the interruption of supplies from elsewhere American manufacturers

have succeded in establishing their cleaners on a firm footing there. There are today a dozen or more business houses selling them, besides several persons acting as individual agents.

The outlook for this class of goods is encouraging. The demand is mostly for a moderate-priced, hand-operated machine, retailing for $12 to $15, but there is a sale of more expensive electrical machines also. This latter fact was illustrated by the recent experience of the manager of a large hardware store, who by working with a selected list of the firm's customers, sold 20 cleaners, after his corps of 13 clerks had declared the price ($135) too high for the local trade.

Diffusing-Glass Fixtures for Interior Lighting With Gas-Filled Lamps.

The very high efficiency attainable by the use of gas-filled tungsten lamps is bringing about their very extensive use in place of the less efficient vacuum-type incandescent lamps. A danger incurred when the new lamps are substituted for the old is that proper consideration is not always given to the particular properties of the new lamps and the requirements these impose, among which are the need for liberal ventilation of the fixture and for thoroughly screening the lamp so as to cut down the intense brilliancy of the highly concentrated filament which in the bare lamp produces very pronounced glare.

In a new line of fixtures these two considerations have been given special attention. Ventilation is provided by free circulation of air through the glassware and holder. By the use of the new Monax glass a high degree of diffusion of the light is obtained with very little absorption, the latter being only slightly greater than that of clear glass. This Monax glass, which is of light weight, transmits the light unchanged in tint and so well diffused that the location of the lamp filament cannot be discerned. A variety of shapes of this glassware are available, together with simple designs of holders and suspensions, making this line of fixtures suitable for all purposes where high efficiency and good illumination are desired without elaborate ornamentation.

Fig. 1 shows a typical pendent fixture with attractive acorn-shaped globe. In this particular design the diameter of the globe is 14 inches and its depth 12 inches. This fixture accommodates lamps from 300 to 500 watts. Four other sizes are available for different sizes of lamps, ranging from 25 to 1,000 watts. These fixtures are obtainable with or without chain.

Fig. 1.—Pendent Fixture.

Fig. 2.—Pendent Fixture.

Fig. 4.—Semi-Indirect Fixture.

Another pendent type is shown in Fig. 2. This is intended for 100 to 300-watt lamps; five other sizes of the same general design accommodate lamps from 25 to 1,000 watts. There are about 25 designs of pendent fixtures in this line.

In Fig. 3 is shown how one of these types looks when hung close to the ceiling without chain. The diameter of the globe in this case is 15 inches and its depth 13. This fixture can be used for lamps from 300 to 500 watts. Another class of ceiling fixtures in which the holder is made of a simple spinning placed directly against the ceiling in place of the canopy is also made; this is made for several forms of glass globes and for lamps ranging from 25 to 1,000 watts.

In the way of semi-indirect fixtures there are several patterns included in this line, of which the one shown in Fig. 4 has a bowl 12 inches in diameter and 6 inches deep for use with 25 to

Fig. 3.—Ceiling Fixture.

100-watt lamps. This bowl gives a very rich lighting effect. The cord for the lamp matches the finish of the brass chains and canopy.

This array of fixtures is known as the Ajax line and is manufactured b the Macbeth-Evans Glass Company, Pittsburgh, Pa.

New Presto Electrical Automobile Specialties.

The use of electricity has not only made automobiling with gasoline cars possible and safe through electric igni-

Fig. 1.—Six-Volt Cigar-Lighter.

tion, but it has also added many conveniences and comforts otherwise unattainable, such as electric starting and lighting. In this line are also a number of electric cigar-lighters which have been found very convenient by the motorist.

A new device of this kind is shown in Fig. 1. This particular one is intended for connection to a six-volt battery and has the lighter tip made of pure platinum specially designed for this voltage. The case of this cigar lighter is made of polished wood with ebony finish. All metal parts are heavily nickel-plated. It is provided with 10 feet of connecting cord with terminals for ready connection to the battery. To energize this outfit it is necessary merely to press the stem, which closes the circuit to the platinum heating wire and furnishes instantaneous light for lighting any cigar, cigarette or pipe regardless of the wind or weather and without stopping the car. A holder is furnished by means of which the outfit can be hung up in any convenient place. This form of cigar-lighter is very compact on account of its watch-case form and has been found entirely reliable. A similar form of it designed particularly for the voltage of the magneto furnished on Ford cars is also made.

Fig. 2.—Cord-Winder and Cigar-Lighter.

In Fig. 2 is shown a new automatic cord-winder together with another form of cigar-lighter and holder. This device winds up the cord automatically and thus eliminates the liability for tangling of the connecting cord for cigar-lighters or inspection lamps. It can be fastened wherever convenient; it is made with a silver-plated name plate and black rubber finish, although also obtainable in heavy brass nickel-plated.

Fig. 3 shows a new electric lamp for mounting on the dash of the car. On account of its rugged and compact construction it is called the "Bull Dog" lamp. It includes a bayonet-type socket and six-volt, two-candlepower tungsten lamp with convenient switch. The lamp is well protected by the housing which also acts as a reflector to throw the light upon gauge glass or other instruments. The entire outfit is heavily nickel-plated.

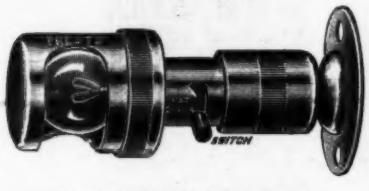


Fig. 3.—Electric Dash Lamp.

Another type of dash lamp is shown in Fig. 4. This lamp is suitable for a variety of purposes. It can be used as a cowl dash lamp secured under the sloping dash; the light can be turned to any angle desired. This lamp can also be attached to the door of the car for the purpose of lighting the step when the door is opened; it also can be arranged for a tonneau lamp for lighting the car interior; if desired it may also be arranged as a canopy lamp in the touring top.

Fig. 4.—Cowl Dash Lamp.

These devices are typical of the very extensive line made by the Metal Specialties Manufacturing Company, Incorporated, 730 West Monroe Street, Chicago, Ill.

Aluminum Company of America Purchases and Will Complete New North Carolina Plant.

The transfer of a large new American aluminum plant from foreign to American ownership is announced in press reports from Charlotte, N. C. French interests were active throughout the greatest part of 1914 in pushing extensive operations at the Narrows of Yadkin River, near Whitney and Badin, Stanley County, N. C., but as a result of the European war the development of the property stopped and was expected to be at a standstill for an indefinite period. In buying the plant, the Aluminum Company of America, with headquarters at Pittsburgh, Pa., announces that the development work will be resumed, and that the plans of the original designers will be carried out with slight changes.

The work that the Southern Aluminum Company had in progress at Badin and Whitney consisted of a hydroelectric installation of great size for the generation of electric power, an electrolytic plant of large capacity for the production of metallic aluminum, works for the purification of alumina, an electrode factory, and the homes and other buildings necessary for the well-being of the employees.

It was early in 1913 that a contract was let for a concrete dam and power house, for tunnels, and for the grading of the electrolytic plant sites. The plans provide for a dam 220 feet high, 1,300 feet long 160 feet thick at the base, and 20 feet at the crest. Swinging as the arc of a circle of 1,600 feet radius, its construction involves the use of from 550,000 to 600,000 cubic yards of concrete. This great dam will store water to generate from 20,000 to 70,000 kilowatts, according to water stage, and will form a pond of 5,000 acres. With the reservoir full, the river will be held in check for five miles along its course, and the old granite Whitney dam will be entirely submerged.

Before the work on this plant was stopped by the war, there were 2,500 men employed on the construction. After production commences, it has been estimated the number required will be between 1,200 and 1,500.

The Aluminum Company of America has plants at Maryville, Tenn., Niagara Falls and Massena, N. Y., and New Kensington, Pa., and has also acquired interests at Edgewater, N. J.

The growing importance of this metal is shown by the figures relating to exports for the last fiscal year. During the 12 months ended June 30, 1915, the exports of aluminum and its manufactures were valued at $3,245,799, compared with $1,101,920 in the preceding year, and with $1,046,915 in the year ended June, 1913.

New Motor-Driven Motion-Picture Projector.

The Precision Machine Company, 317 East Thirty-fourth Street, New York City, has recently developed a new projector, which is illustrated herewith. The mechanism is entirely inclosed in a dustproof and soundproof case designed so that it may be quickly attached or detached from the machine. Large doors on both sides permit of quick, easy threading of the film, oiling, etc.

The intermittent movement is the well known cam and star type. The ratio of movement to exposure is such that the film is not injured, though moved quickly, while the exposure is long enough to bring out all details. The cam and star work in an oil bath. Only one eccentric bushing, hardened and lapped and having a bearing 1.375 inches long, is used. Therefore it is much easier to set than the intermittents, which have two eccentric bushings. All parts are assembled complete and can be quickly removed from or replaced in the machine.

All gears are cut from cast vanadium-iron and mesh into tool-steel pinions, which are hardened where high-speed duty is required of them. The faces are wide and the teeth so cut that they roll together, as in a watch, practically without friction. The bearings have cast-iron bushings and are easily replaced.

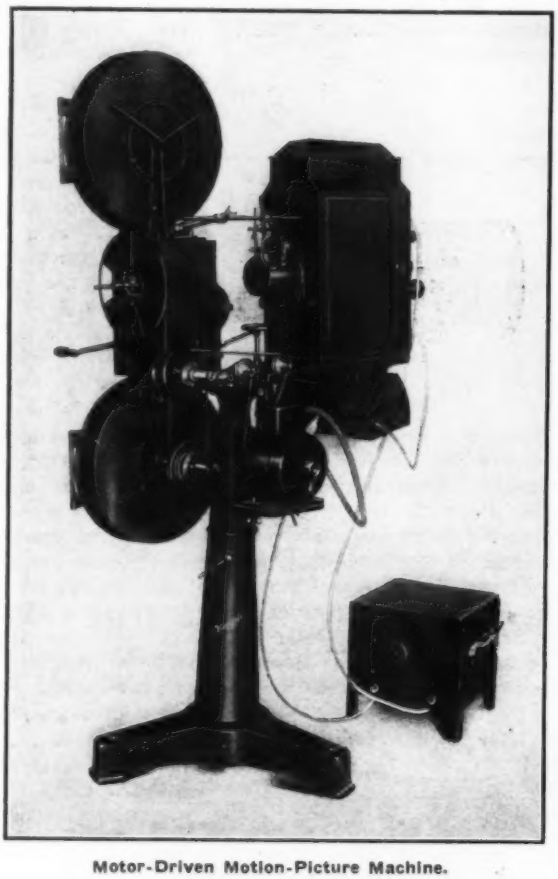
The drop in front of the aperture of the automatic shutter is raised by a centifugal governor, when the machine reaches a certain speed and gravity closes it when the machine stops.

The revolving shutter is placed in front of the moving-picture lens, and is made in two types, namely, the three-wing shutter for direct current and the two-wing shutter for sixty-cycle alternating current. The shutter can be easily and quickly set to eliminate the "travel ghost" or white streaks while the machine is in operation.

The magazines are made of heavy-gauge sheet metal, and are clamped to the top and bottom of the mechanism. Fireproof valves protect the film in the magazines. The upper valve is part of the mechanism, while the lower is built into the magazine. Spring latches hold the door firmly closed. Magazines are furnished for 2,000-foot reels. The take-up is driven from the main driving shaft.

The lens jacket or mount is a part of the Simplex head, and therefore only the lens tube is required. It can be quickly taken out or put back, and is focused by turning a knurled knob conveniently placed on the outside of the mechanism.

The stereopticon lens is of the achromatic type, which is found to give a flat field. It is mounted in a holder suspended by a ball-and-socket joint, from an arm attached to the mechanism. This joint permits of universal adjustment, making it an easy matter to properly register the stereopticon picture on the screen. The lens holder is so designed that the regular double combination jacketed stereopticon lens, either quarter size or half size, may be used if desired.



Motor-Driven Motion-Picture Machine.

The distance between the condensers can be adjusted so as to eliminate the blue spot or ghost which frequently appears in the center of the picture. The condensers rest in a frame, which keeps them in line with each other, but permits their instant removal for cleaning or replacing.

The carrying capacity of the arc is 75 amperes. Carbon holders are furnished for carbons one-half to three-quarter inch diameter and 12 inch upper and 6 inch lower length. The arc lamp can be withdrawn through the back of the lamp house, so that all parts are readily accessible. When it is again pushed into place the back of the lamp house automatically closes behind it.

Ventilation of the lamp house is provided to insure a comfortable temperature, even with a very high current at the arc.

The pedestal is made of heavy cast iron, with enamel finish. It rests on three points on the floor, and forms a rigid support for the machine. It is swiveled so that it can be swung from side to side or pointed up or down as occasion requires. When the right direction is obtained a simple locking device holds it firmly in position. The lamp house has a parallel swinging motion, so that the light is quickly brought into position for either the moving picture or stereopticon lens.

A snap switch is provided on a cast-iron support underneath the lamp house, protected with a heavy metal cover. The rheostat supplied is of the iron-grid type. It is inclosed in a case which allows ample ventilation, and is adjustable from about 22 to 45 amperes.

The machines are equipped with one-eighth-horsepower motors furnished by the Robbins & Myers Company, Springfield, O. The motor is mounted on a cast-iron shelf.

This new machine has been adopted by the United States Government War Department, and was awarded a grand prize at the Panama-Pacific International Exposition.

U-S-L Car-Lighting System Not Affected by Prior Litigation.

A decision, of interest to railroad men and particularly to car-lighting men, was handed down on November 4 by Judge Hazel in the United States District Court, Western District of New York.

It will be remembered that recently Judge Hazel, sitting in this court, sustained the Creveling patent No. 747,686. It was maintained by the owners of this patent that the decision was broad enough to cover the use of the ampere-hour meter system of car-lighting, as put out by the United States Light & Heat Corporation, and it was sought to bring this system into the accounting ordered by the court.

The court held that the present standard car-lighting equipment, involving the use of an ampere-hour meter to control battery charging, as put out by the United States Light & Heat Corporation, does not come under the injunction or the accounting ordered in the prior decision sustaining the Creveling patent.

Current Electrical News

ATLANTIC STATES.

BATAVIA, N. Y.—The sum of $23,000 in bonds has been authorized for the purchase and installing of machinery necessary for an electric plant. Address the town clerk.

SANBORN, N. Y. — Sanborn-Pekin Power Company, Incorporated. To generate electricity for all purposes. Capital, $10,000. Incorporators: Henry B. Treicher, J. B. Hudson and B. L. Hudson.

CAMDEN, N. J.—The Victor Talking Machine Company will shortly construct one four-story and one six-story reinforced concrete and steel building at its plant here. The electrical equipment will be thoroughly modern. Ballinger & Perrot, Philadelphia, are the architects.

EASTON, PA.—The Easton Hospital will erect a new $100,000 building shortly. Plans are in progress. William H. Michler, Easton, is the architect.

PHILADELPHIA, PA. — A three-story brick, stone and reinforced concrete building for employees will be erected for the American Pulley Company, at Nicetown, a suburb. The electrical installation will be included in the general contract. Ballinger & Perrot, Philadelphia, are the architects.

PHILADELPHIA, PA. — The Midvale Steel Company will erect an immense brick and concrete machine shop at its plant in the Nicetown section here. It is reported that all machines will be driven electrically.

PHILADELPHIA, PA.—The Baldwin Locomotive Works will erect a four-story brick and concrete electric truck shop at its plant, Eighteenth and Buttonwood Streets. F. Jasperson is the engineer in charge.

PENNSBORO, W. VA. — H. E. Hopkins and others have organized the Pennsboro Ice and Power Company, and will construct a plant for the production of ice and the generation of electric current. The capital stock is $25,000. L.

NORTH CENTRAL STATES.

STEUBENSVILLE (YELLOW CREEK), O.—The Kenohio Electric Company will erect a light and power plant at Yellow Creek, Jefferson County. Address president of the Kenohio Electric Company, W. J. C. Kenyon, 332 South Michigan Avenue, Chicago, Ill.

CINCINNATI, O.—The Board of Education will remodel the electrical work of the Fulton school. C. W. Handman, business manager, will receive bids until December 13. Plans and specifications are on file at the office of the board. L.

CINCINNATI, O.—The Hess Spring and Axle Company will build an addition to its plant at a cost of about $60,000, which will involve a considerable amount of electrical equipment. The addition will be used in the manufacture of automobile axles. L.

CINCINNATI, O.—A municipal electric plant for Cincinnati is the object of the Federated Improvement Associations, which have placed themselves on record to this effect. It is proposed to issue bonds of the city to the amount of $3,000,000, this sum being considered sufficient for the purpose. L.

TOLEDO, O.—The Beverly Service Company; capital, $10,000; electricity, gas and water. Incorporators: Clifford T. Hanson, Andrew F. Camenzind, Donald F. Hiett, William A. Moll and J. W. Lane.

BICKNELL, IND.—J. W. Stewart, of the Stewart Electric Company, Cincinnati, O., will erect a $100,000 power plant. Electric and water-power machinery will be purchased.

HEBRON, IND. — Hebron Light, Heat and Power Company; capital, $25,000; utility service; directors, Fred A. Bremer, Charles B. Alyea, William J. Mulinex, Ralph Alyea, D. B. Fickle.

LAFAYETTE, IND.—At a recent session of the county commissioners it was decided to advertise for bids for the erection of 12 ornamental light posts to be placed around the public square. The date for opening the bids has not been set. It is the intention of the board to have the posts installed not later than the middle of December. Address the county clerk.

DECATUR, ILL.—The Board of Local Improvements has recommended to the city council for passage an ordinance providing for ornamental lights on East Eldorado Street, from Main Street to Front Street, to include 42 three-light standards, at an estimated cost of $3,531.57. Z.

GIRARD, ILL.—A lighting system, to be installed around the town square, is under consideration by the council.

HIGHLAND PARK, ILL.—An ornamental street-lighting system is to be installed under the management of the Business Men's Association. Address the secretary.

MACOMB, ILL.—The Home Electric Construction Company has recently secured contract for the electrical work in the new postoffice building at Beardstown, Ill., and also a contract for a system of 39 five-light curb posts for the city of Bushnell; also an electric elevator job for the St. Francis Hospital at Macomb, Ill.

CLINTON, MICH. — The sum of $5,000 will be expended for additional electrical equipment. Address the town clerk.

MERRIMACK, WIS.—A franchise has been granted to A. M. Farnworth to install an electric light plant here.

FAIRBANKS, IOWA. — Bonds to the amount of $6,000, have been voted for municipal lighting. Address the city clerk.

LOW MOOR, IOWA. — Electric light bonds in the sum of $4,500 have been authorized. Address the town clerk.

SPRINGFIELD, MO.—C. E. White, general manager of the Ozark Water and Power Company, reports a contract, approved by a vote of the citizens, with Monett, Mo., for supplying current for the municipal electric-plant at that place, the term being 10 years.

TRENTON, MO.—The Trenton Gas and Electric Company will expend $100,000 in improvements. Plans are now being drawn for the work. Address the general manager.

MINNEAPOLIS, MINN. — Nearly $4,000,000 will be spent in Minnesota and North and South Dakota in improvements by the Northwestern Telephone Exchange Company during the coming year, according to C. E. Yost, president of the Northwestern group of the Bell Telephone Company.

SOUTH CENTRAL STATES.

CARLISLE, KY. — The Carlisle Light and Power Company has increased its capital from $15,000 to $30,000 and has contracted with a Louisville concern for an ice-manufacturing plant which will be installed at once.

LOUISVILLE, KY.—A large dairying plant is to be erected by D. H. Ewing's Sons which will require 22 motors aggregating 110 horsepower. It is expected that the company will also equip with an engine and generator, as it will probably make use of its own power. Plans are being prepared by John Bacon Hutchings, Columbia Building, Louisville. G.

PROVIDENCE. KY.—The city has voted a $20,000 bond issue to provide for construction and equipment of an electric-lighting plant and system. At present the domestic and commercial demand is being supplied by the Providence Electric Light Company, which is operating without a franchise. The owners established the plant and operated for considerable time before the venture was profitable. It and the city, however, were unable to agree on terms for street lighting and the supporters of the municipal project took the ground that the only way to get lighted streets was to put in a municipal plant. It is stated that negotiations looking toward purchase of the existing plant will be undertaken. G.

MEMPHIS, TENN.—The Board of Aldermen is in favor of a municipal lighting plant. Adress John W. Benee, mayor.

MARKS, MISS.—James Fitzel has been granted franchise for an electric light plant and will furnish lights for this place.

ST. FRANCISVILLE, LA.—Bonds

have been voted for a municipal light plant. Address the village clerk.

LAMPASAS, TEX.—The Lampasas Light and Power Company has been organized with a capital stock of $8,000. Incorporators: Emil P. Haby, T. S. Alexander and E. Haby, Sr. It will build an electric light and power plant.

M'KINNEY, TEX.—The city commission has sold the municipal electric light and power plant to the Texas Power and Light Company, of Dallas. The sale is subject to confirmation by referendum vote of the people of the city. D.

ONALASKA, TEX. — The electric light and power plant of the lumber mill of the West Lumber Compa here, which was recently destroyed by fire, will be rebuilt. D.

PLAINVIEW, TEX. — Judge I. R. Kelso, of St. Louis, Mo., and associates, have taken preliminary steps towards the construction of a large electric power station here. It is stated the syndicate will invest not less than $1,000,000 in electrical and water works enterprises in Plainview and towns of the surrounding country. Power for operating irrigation pumping plants and other industrial purposes will be furnished. H. C. Randolph, of Plainview, is also interested in the project. D.

WESTERN STATES.

EAST SCOBEY, MONT.—It is reported the Scobey Electric Light Company, owing to an increase of business, will install a larger and more modern plant in this city in the immediate future. O.

HEDGESVILLE, MONT. — Plans are being made for the installation of an electric street-lighting system and modern water works plant. Address city clerk.

YUMA, ARIZ.—The Arizona Power Company is to build another hydroelectric power plant on Fossil Creek.

SALT LAKE CITY, UTAH.—W. J. Lloyd, manager of the mountain district for the Western Union Telegraph Company, says that the company will, within the next year, spend one million dollars in line extensions and betterments in the mountain territory.

SEATTLE, WASH.—Superintendent of Lighting J. D. Ross, in making his report to Mayor H. C. Gill, and the city council, on various power projects he has been investigating for the last three months, to be used as an auxiliary to the municipal power plant, will recommend the acquirement of a developed rather than an undeveloped project. Among the developed projects which Superintendent Ross has investigated, is the Elwha power plant, which has a present capacity of 6,000 kilowatts and which will be developed to 15,000 kilowatts, if the city desires. This project has a development limit of 125,000 kilowatts. It is 90 miles from Seattle by direct route. The undeveloped power projects on which Superintendent Ross will make a report include the Hebb site, on White River, the Cushman project at Lake Cushman, and the Sauk-Suiattle project, near Derrington. O.

FRESNO, CAL. — The Board of Trustees has adopted plans for an electrolier system and has also adopted a resolution calling for the placing of the electroliers.

LOS ANGELES, CAL. — The city has passed a resolution authorizing the sale of bonds amounting to $3,432,000, the proceeds to be used in the acquisition and construction of electric generating works and distributing system for supplying the city with current for light, heat and power purposes. Bonds to the amount of $1,026,000 for the same purpose were recently sold. Power will be developed along the city's aqueduct already constructed.

REDDING, CAL. — L. T. Alward, chairman of the lighting committee of the city council, has notified the California State Railroad Commission that a municipal lighting system will be put in by Redding.

SAN FRANCISCO, CAL.—Among the improvements to be made by the Pacific Gas and Electric Company during 1916, are the following: A new submarine cable across the Golden Gate, to cost $273,000; an office building, in San Francisco, to cost $114,000; plant at Knight's Landing, Cal., to cost $13,000; right of way for tower line from Oakland to Warm Springs, Cal., to cost $22,500; and the installation of meters for all the present flat rate consumers in Sacramento, Cal., to cost $24,000.

WATSONVILLE, CAL. — G. T. Prince, formerly of Oakland, Cal., has bought the T. C. Electrical Works, of this place, from the former owners.

PROPOSALS.

NAVY ELECTRICAL SUPPLIES.—The Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., will receive bids on November 30, 1915, for the following material: Miscellaneous interior communication cable, 700 radio head gear receiver cords; miscellaneous magnet wire, miscellaneous rubber-insulated wire, miscellaneous single-conductor wire, miscellaneous twin-conductor wire, schedule No. 9001, for delivery at Navy Yard, Brooklyn, N. Y.; miscellaneous rubber-covered single-stranded wire, 10,000 feet duplex telephone wire, schedule No. 8999, for delivery at Navy Yard, Brooklyn, N. Y.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 19,171. DRY BATTERIES.—An American consular officer in Norway reports that a firm in his district wishes to correspond with exporters and dealers in dry batteries for electric pocket lamps.

NO. 19,178. TELEPHONE WIRE.—A telephone company in Norway wishes to buy 3,000 kilograms (6,613.86 pounds) of silicium bronze wire; the diameter of the wire should be 1.3 (0.05118 inch), with 40 per cent minimum conductivity and 154.3 pounds minimum breaking strain per square millimeter, the wire being according to British Post Office specifications. Correspondence in English. Definite terms are wanted.

NO. 19,191. PUMPS AND MOTORS.—An American consular officer in the Canary Islands reports that a firm desires to purchase a number of electrically driven water pumps and electric motors. Prices c. i. f. port of entry, if possible, and payment, cash against documents.

NO. 19,127. ELECTRICAL SUPPLIES, ETC.—The Bureau is informed that a man in Spain desires to represent American dealers in commercial chemicals, electrical supplies, and mining machinery.

NO. 19,141. ELECTRICAL MATERIAL, ELEC.—A business firm in the United States writes that a firm in Portugal desires to represent or buy for its own account electrical material. Reference is given. Correspondence should be in Portuguese.

NO. 19,147. ELECTRICAL GOODS.—An American consular officer in Denmark writes that a man in his district desires to represent American manufacturers of electrical goods. References are given. Correspondence may be in English.

NO. 19,218. ELECTRICAL GOODS. A report from an American consular officer in India states that a business man in his district desires to communicate with manufacturers of electrical goods.

NEW INCORPORATIONS.

LIBERTY, ILL.—The Liberty Electric Company has been incorporated with a capital of $2,500, by Steven G. Lawlese and others.

HEBRON, O.—The Hebron Light, Heat and Power Company has been chartered with a capital of $25,000, by Fred A. Bremer, Charles B. Alyea and others.

LAPORTE, IND. — The Wanatah Electric Company has been organized with a capital of $5,000, by H. H. Keller, A. H. Kimble and Lemuel Darrow.

CONCORDIA, KAN.—The Concordia Electric Light Company has increased its capital from $125,000 to $140,000.

NEW YORK, N. Y.—Chirqui Electric Corporation. Electrical motors. Capital, $150,000. Incorporators: Joseph A. Stapleton, George Jameson, Frank R. Owen.

NEW YORK, N. Y.—International Electric Products Corporation. Capital, $5,000. Incorporators: M. E. McLean, William Dunilier and F. B. Knowlton.

CHICAGO, ILL. — Goodman Electric Construction Company. Capital, $10,000. Incorporators: Lester E. Goodman, Ralph E. Stern and Harold J. Goldberger.

WILKESON, WASH.—The Pierce County Light and Power Company has been incorporated with a capital of $100,000, by F. L. Van Nice, Hiram Davis, W. H. Pringle.

LAMPASAS, TEX.—The Lampasas Light and Power Company has been incorporated with a capital stock of $8,000, by Emil F. Haby, T. S. Alexander and E. Haby, Sr.

NEW YORK, N. Y.—The Simplexite Company, Inc. Electrical devices, etc. Capital, $10,000. Incorporators: William E. Nash, Richard Nash and Henry Goldstein, New York City.

ROCHESTER, N. Y. — Riverside Electric Company, Incorporated. Electrical contracting. Capital, $2,000. Incorporators: Norah K. Ward, Edwin L. North, Walter J. Moore.

BRIGHTON, IOWA.—The Brighton Hydroelectric Company has been organized with a capital of $50,000, by W. B. Kemp, C. S. Woodford, Fred Williams and Bertha Thompson.

BRONX, N. Y.—M. & M. Electric Company, Incorporated. Electrical contracting, etc. Capital, $5,000. Incorporators: Stanley W. Mills, Benjamin C. Raymond and Lena F. Mundt.

NEW YORK, N. Y. — American Sewing Machine & Electrical Company, Incorporated. Electrical motors. Incorporators: Julius Halperin, Abraham Nizin, Irving Silverman. Capital, $1,200.

LAPORTE, IND. — The Wanatah Electric Company has been incorporated with a capital of $5,000, by Harry H. Keller, Alfred H. Kimble and others, to manufacture and sell electricity.

WELLSVILLE, N. Y.—The Allegheny County Electric Light, Heat and Power Company has been incorporated with a capital of $25,000, by J. Berger, B. Graham, C. H. C. Beakes, and others.

HOUSTON, TEX.—The Texas Gas and Electric Company has been organized here with a nominal capital stock of $1,000. Incorporators: C. L. Carter, W. A. Parish and Raymond Neilson. D.

SCHENECTADY, N. Y.—Delanson and Quaker Street Electric Light and Power Company, Inc. Incorporators: Frank W. Wilber, Quaker, N. Y.; Earl V. Tompkins, and Chas. E. Washburn, both of Delanson, N. Y.

NEW YORK, N. Y.—G. E. Engineering Company, Inc. Electrical machinery, etc. Capital, $10,000. Incorporators: Geo. M. Wheeler, Lewis J. McDowell, and Franklin L. Harris, 6 Ithaca Street, Elmhurst, L. I.

OLYMPIA, WASH. — The Pierce County Light and Power Company has filed articles of incorporation here. The capital stock of the company is $100,000, the incorporators being F. D. Van Nice, Hiram Davis and W. H. Pringle.

JACKSONVILLE, N. C.—The Jacksonville Electric Light Company has been incorporated with a capital stock of $10,000, by I. M. Avery, E. M. Koonce, and others, for the purpose of engaging in the electric-lighting business.

CHICAGO, ILL.—The Kedzie Fixture Company has been incorporated with a capital stock of $5,000. The company is to manufacture and install gas and electric fixtures. Abraham Slevena, Elsie Slevena and James L. McAuliff are the incorporators. Z.

CHICAGO, ILL. — The Goodman Electric Construction Company has been incorporated with a capital stock of $10,000, to manufacture and deal in electrical merchandise. Lester E. Goodman, Ralph F. Stern and Harold J. Goldberger are the incorporators.

PHILADELPHIA, PA.—The Ocean County Electric Company, New Jersey, has been incorporated with a capital of $525,000, to operate in Ocean County. Joseph P. Murray, Leighton P. Stradley and F. Stanley Saurman, all of Philadelphia, Pa., are incorporators. A.

SALEM, ORE.—The North Coast Power Company, with headquarters at Vancouver, Wash., has obtained permission to do business in Oregon. The new company was organized to take over the properties of the Washington-Oregon Utilities Company, which concern was foreclosed and the properties sold at a receivers' sale. The new corporation is capitalized at $1,750,000. Officers are: Clarence M. Brown, president, Philadelphia; L. J. Morris, secretary, Philadelphia; H. L. Harries, vice-president, Vancouver, Wash.; B. F. Donahue, assistant secretary and treasurer, Vancouver, Wash. O.

FINANCIAL NOTES.

There has been placed on the regular list of the Philadelphia Stock Exchange $3,322,800 additional stock of the American Telephone & Telegraph Company, exchanged for bonds of the company, making total stock listed $375,299,700.

The Kansas City Railway & Light stockholders' protective committee's plan of reorganization, supplemental to the plan of July 30, approved by Judge Hook, Kansas City, has now been announced. W. W. Gurley, Chicago, and John H. Atwood, Kansas City, have been appointed to carry out the plan. Stockholders and creditors must file acceptances by December 20. The plan provides that 80 per cent of the outstanding stock shall determine the basis of division as between the two companies. The stock of these two segregated operating companies shall be deposited with two sets of three trustees each, one to be selected by the preferred stockholders, another by the common stockholders, and the third by these two. They will issue preferred and common beneficial certificates, one for each share of stock now outstanding. The old status as between preferred and common to be maintained as between the preferred and common beneficial certificates, except that the preferred is to be cumulative instead of non-cumulative. A syndicate was formed in August to underwrite the exchange of securities under the plan of July 30 and also to take $3,000,000 to $4,000,000 of the new street railway company first mortgage bonds at par. Opportunity will be given to all stockholders to participate in these underwritings. More than 90 per cent of each class of stock has been deposited with the committee, which voted to submit the entire plan in all its details to the stockholders immediately and in the meantime all non-depositing stockholders will be given further opportunity to participate.

Dividends.

	Term	Rate	Payable
Cent. Miss. Val. Elec. Prop.	Q	$1.50	Dec. 1
Colo. Pw., pf.	Q	1.75%	Dec. 15
Mid. West Util., pf.	Q	1.5 %	Dec. 1

Reports of Earnings.

KEYSTONE TELEPHONE.

	1915	1914
October gross	$ 115,124	$ 110,499
Net	56,480	55,072
Surplus	29,536	29,125
Ten months' gross	1,129,271	1,101,896
Net	566,645	558,655
Surplus	300,322	298,736

AURORA, ELGIN & CHICAGO.

	1915	1914
September gross	$168,334	$183,355
Net	57,272	63,494
Surplus after charges, depreciation, etc.	11,952	19,856
Three months' gross	545,797	611,210
Net	201,151	250,512
Surplus after charges, depreciation, etc.	65,666	119,152

EAST ST. LOUIS & SUBURBAN.

The East St. Louis & Suburban Company has issued the following report:

	1915	1914
September gross	$ 206,405	$ 216,514
Net after taxes	83,952	85,972
Surplus after charges	21,048	21,980
Twelve months' gross	2,424,763	2,718,761
Net after taxes	983,250	1,018,889
Surplus after charges	223,323	363,123
Deficiency after preferred dividends	76,677	*46,457

*Surplus.

VIRGINIA RAILWAY & POWER.

The Virginia Railway & Power Company has issued its report for the year ended June 30, 1915. The combined income account, including subsidiaries, compares as follows:

	1915	1914
Gross	$5,109,622	$5,156,048
Expenses	2,469,074	2,465,908
Net	2,640,548	2,690,140
Other income	80,919	80,910
Total income	721,467	2,771,050
Taxes, etc	298,551	308,112
Balance	2,422,916	2,462,938
Charges	1,136,120	1,108,325
Surplus	1,286,796	1,354,613

AMERICAN LIGHT & TRACTION.

American Light & Traction Company reports earnings for the year ended September 30, 1915, as follows:

	1915	1914
Earnings on stocks owned	$ 4,239,114	$3,661,448
Miscellaneous earnings	745,940	728,835
Total earnings	4,985,054	4,390,083
Expenses and taxes	156,620	148,049
Net earnings	4,828,434	4,242,034
Preferred dividends	854,172	854,172
Surplus	3,974,262	3,337,862
Cash common dividends	1,592,365	1,443,430
Stock common dividends	1,592,365	1,443,430
Balance	789,532	501,002
Total surplus September 30	10,371,970	9,582,438

WISCONSIN-MINNESOTA LIGHT & POWER.

For the twelve months ended September 30, 1915, Wisconsin-Minnesota Light & Power Company, a subsidiary of American Public Utilities Company, reported earnings as follows:

	1915	1914
Gross earnings	$1,085,309	$1,011,944
Expenses and taxes	527,075	519,384
Net earnings	558,234	492,560

MASSACHUSETTS ELECTRIC.

Massachusetts Electric Company reports for the quarter ended September 30:

	1915	1914
Gross	$2,874,745	$2,948,926
Expenses	1,857,152	1,762,642
Net	1,017,593	1,186,284
Charges and taxes	519,585	523,271
Surplus	498,008	663,013

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Nov. 15	Nov. 8
American Tel. & Tel. (New York)	127⅞	128
Commonwealth Edison (Chicago)	144	140
Edison Electric Illuminating (Boston)	238	238
Electric Storage Battery, common (Philadelphia)	67	71
Electric Storage Battery, preferred (Philadelphia)	67	71
General Electric (New York)	177½	177
Kings County Electric (New York)	120	120
Massachusetts Electric, common (Boston)	7	7
Massachusetts Electric, preferred stamped (Boston)	41	40
National Carbon, common (Chicago)	155	150
National Carbon, preferred (Chicago)	119¾	121
New England Telephone (Boston)	132	132½
Philadelphia Electric (Philadelphia)	27⅜	29¼
Postal Telegraph and Cables, common (New York)	82	83
Postal Telegraph and Cables, preferred (New York)	65½	65¾
Western Union (New York)	87¾	87¾
Westinghouse, common (New York)	69⅞	69
Westinghouse, preferred (New York)	—	143

COMMONWEALTH POWER, RAILWAY & LIGHT.

Twelve months ended September 30, 1915:

	1915	1914
Earnings on stocks	$2,405,644	$2,490,687
Miscellaneous earnings	596,394	514,064
Total gross	3,002,038	3,049,486
Expenses and taxes	141,867	144,040
Amortization	28,932	21,043
Interest charges	608,630	651,804
Total income	2,222,608	2,232,598
Preferred dividends	960,000	960,000
Surplus	1,262,608	1,272,598

NEW PUBLICATIONS.

SMELTER FUMES.—The Bureau of Mines has issued Bulletin 98 containing the report of the Selby Smelter Commission. This commission was made up of E. C. Franklin, Ralph A. Gould and the late Joseph A. Holmes, and prepared this report as a result of the litigation arising on account of the offending fumes from the Selby Smelter in Solano County, Cal.

FUSIBLE BOILER PLUGS.—Technical Paper No. 53 of the Bureau of Standards, Washington, D. C., is entitled "An Investigation of Fusible Tin Boiler Plugs," by George K. Burgess and P. D. Merica. This gives the specifications for such plugs and an investigation of their performance. The principal conclusion is that there should be no zinc present in such plugs.

PERSONAL MENTION.

MR. W. R. THURSTON has been appointed manager of the Mine & Smelter Supply Company's Salt Lake City branch. Mr. F. E. Marcy, former manager, will still be associated with the company and devote his efforts in selling and developing the Marcy ball mill.

MR. THOMAS CHEYNE, of Paterson, N. J., has been appointed vice-president of the Reading (Pa.) Transit and Light Company, with headquarters in Reading. This is a new position and the appointee will be assistant to E. W. West, of New York City, the new president and general manager, who assumed the office on November 1.

MR. P. P. HINCKLEY, of Chicago, has joined the sales force of the Connecticut Telephone and Electric Company, Meriden, Conn., and will handle the jobbing trade east of Chicago. The company's connections in Chicago and the west will be managed by Mr. J. W. Fulton, with offices at 1100 Karpen Building, Chicago.

MR. W. J. LAUFENBURG, formerly secretary of the Kansas City Electric Club, has gone to Denver, to take up special sales work with that office of the Western Electric Company. Mr. Laufenburg spent one year with the company at Chicago, and for the past eleven and one-half years has been connected with the Kansas City branch.

MR. RAY PALMER has been elected vice-president and general manager of the New York & Queens Electric Light & Power Company, Long Island City, N. Y. Mr. Palmer was formerly Commissioner of Gas and Electricity in Chicago, Ill., and at the termination of his office, midyear in 1915, in that capacity he established a private practice as a consulting engineer. Mr. Palmer brings to the new position a splendid experience and a highly enviable reputation. While commissioner in Chicago he established a record for efficiency and progress which has seldom been equalled in the conduct of a municipal undertaking of this magnitude.

OBITUARY.

MR. HERBERT MERRILL WHEELER, engineer of electrical distribution, Chicago Surface Lines, died in Chicago on November 5. He was born in Shewano, Wis., in 1876. When only 20 years old he was graduated from the electrical engineering course at the University of Minnesota. For three years he was employed by the Fort Wayne Electric Corporation, Fort Wayne, Ind. In 1899 he became assistant engineer of the North Chicago Street Railroad Company, resigning four years later to take a position as instructor of mathematics and engineering at Lewis Institute, Chicago. On the formation of the Chicago Railways Company in 1907 he became its electrical engineer, and in 1909 was promoted to be assistant chief engineer. When the Chicago Surface Lines took over the operation of the entire street railway system of Chicago in February, 1914, he was appointed to the position he held till his death. Mr. Wheeler was a veteran of the Spanish-American War of 1898. He was a very active member of Company E at the military training camp established a few months ago at Fort Sheridan, Ill.; his death was due to lesion of the brain attributed to excessive exertion at that time. Mr. Wheeler was chairman of the Electrical Section of the Western Society of Engineers and had served on various of its committees. He is survived by his widow and two young sons.

DATES AHEAD.

American Physical Society. Meeting at University of Chicago, Chicago, Ill. November 26 and 27. Secretary, A. D. Cole, Columbus, O.

American Society of Mechanical Engineers. Annual meeting, New York City, December 7-10. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

National Independent Telephone Association. Annual convention, Hotel La Salle, Chicago, December 8-10. Secretary, F. B. MacKinnon, Washington, D. C.

American Association of Engineers. First annual convention, Hotel La Salle, Chicago, Ill., December 10-11. Secretary, Arthur Kneisel, 29 South La Salle Street, Chicago, Ill.

American Institute of Chemical Engineers. Winter meeting, Baltimore, Md., January 12-15, 1916. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

With the Electrical Manufacturers

John A. Roebling's Sons Company, Trenton, N. J., was visited by another fire recently, but the electrical department was not affected this time. Damage was confined to the department engaged in the manufacture of steel cables.

Crouse-Hinds Company, Syracuse, N. Y., has issued bulletin No. 1000 D, dealing with motor-starting switch condulets. These devices are ironclad switches for starting small three-phase induction motors. They are provided with locking doors, permitting the switch to be locked in open or closed position. They are made in several types and rated at 30 and 60 amperes for 250 and 500-volt circuits.

The Lincoln Electric Company, Cleveland, O., is making special battery-charging sets for use with Milburn "Light Electrics," the lightweight electric vehicles manufactured by the **Milburn Wagon Company,** of Toledo, O. These are described in a recently issued illustrated bulletin, entitled "Milburn Light Electric Charger." The outfit is a very compact and easily controlled motor-generator set similar to the Lincoln battery charger, which was described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of December 5, 1914.

Holophane Works of General Electric Company, Cleveland, O., has ready for distribution catalog No. 303, on Ivanhoe metal reflectors and fittings for multiple Mazda lamps, both vacuum and gas-filled types. Listed in the catalog is a large assortment of metal reflectors and accessories for industrial, railway, commercial and miscellaneous lighting. A group of fixtures for giving daylight colors is also included. A valuable section gives illuminating engineering data and suggestions bearing on the use of Ivanhoe industrial reflectors.

Shapiro & Aronson, 20 Warren Street, New York City, have issued catalog No. 18 on fine-quality lighting fixtures. This comprises 72 large pages, on which are shown some 50 very handsome designs of this well known firm's Roman bronze line of fixtures. There are also shown about 140 miscellaneous fixtures, ranging from highly ornate to the comparatively simple patterns. The large assortment shown in the catalog includes many distinctive types of fixtures. The greatest number are chain-type fixtures, but there are also many cei-

ing, bracket and pendent types. From such a varied assortment it is possible to select equipment suitable for any well furnished room of a residence.

Cooper Hewitt Electric Company, Hoboken, N. J., has issued bulletin No. 62, which is entitled "Economics of Industrial Lighting." This is a very handsomely illustrated publication giving the chief principles of illuminating engineering as applied to the scientific lighting of factories, shops and works as set forth by the leading authorities on the subject. A large number of illustrations show typical installations of factories illuminated by Cooper Hewitt mercury-vapor lamps. The company has also issued bulletin No. 44C, which gives the latest information regarding Cooper Hewitt quartz lamps. Another new bulletin is No. 52 on the quartz lamp laboratory outfit for the production of ultra-violet light. All of these bulletins are printed on glare-free paper.

The Stone Base & Panel Company, a new concern recently incorporated at Columbus, O., will make a substitute for slate used on electric switchboards, etc. The product consists of a peculiar quality of stone quarried in southern Ohio, which is chemically treated in vats, to increase its insulating properties and permit of a polished surface. The advantages claimed for it over slate are that it is about half the cost, is free from any mineral substance that would decrease its insulating property, and is much less susceptible to breakage because more elastic than slate. The company claims to have the indorsement of a number of electrical men. The chemical process is covered by patent. R. E. Hyde, of Cleveland, O., is the discoverer of the process. The president of the company is C. A. Stribling, a leading Columbus architect.

The Richardson-Phenix Company, Milwaukee, Wis., has issued two new bulletins. No. 50 describes the Phenix force-feed lubricator, which is particularly designed for lubricating power-plant machinery. This outfit is very sturdily built and has been found well suited for the purpose. The bulletin describes the various models of this apparatus with the aid of numerous detail views. Typical installations are also shown. The advantages of this equipment are set forth, among which is its moderate price. Bulletin No. 60 is devoted to the Richardson sight-feed oil pump. The correct principles of cylinder lubrication are explained. The construction of the model M sight-feed oil pump is then described and its application made clear. Auxiliaries are also described. The lubrication of gas-engine cylinders is discussed. Many views are shown of various parts of the equipment, typical power-plant installations and important buildings in which they are used.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has issued Booklet B, which is entitled "Battery-Charging Equipment." The types of equipment described include the well known universal unit type for large fleets and public garages; panels and rheostats for individual vehicle charging; and rheostats for charging batteries used on starting, lighting and ignition systems of gasoline cars. The universal unit type of charging equipment consists of a number of self-contained unit sections assembled in frames much as sectional filing cabinets are assembled. Some of the advantages for this type of equipment as pointed out in this booklet are: simplicity and durability, accessibility, ease of installation, ease of operation, ease with which new sections may be added, automatic protection without complication, self-contained construction and compactness. The equipment for individual vehicle charging described consists of four standard types; there are also two standard types for charging batteries used on lighting, starting and ignition systems of gasoline cars.

Record of Electrical Patents

Issued by the United States Patent Office, November 9, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,159,346. **Socket Shell.** L. W. Andersen, Waterbury, Conn. Manner of securing cap and body together and preventing relative rotation.

1,159,354. **Electrical Testing Apparatus.** H. J. Blakeslee, Hartford, Conn. For testing meters.

1,159,359. **Magneto Hand-Generator.** H. P. Clausen, assignor to Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. Has particular brush and commutator arrangement for alternately short-circuiting armature and sending impulse to telephone line.

1,159,361. **Electric Switch.** R. C. Cole, assignor to Johns-Pratt Co., Hartford, Conn. Knife-blade fuses mounted on cover may be moved out of engagement with stationary clips before cover is raised.

1,159,373. **Photographic-Printing Machine.** W. E. Grote, New York, N. Y. Light circuit closed by movement of negative and sensitive sheet into printing position.

1,159,376. **Process for Producing Acetic Acid from Acetylene by Electrolysis.** C. Hansen and A. Weindel, assignors to Synthetic Patents Co., New York, N. Y. Acetylene is oxidized on anode by aid of acid electrolyte containing mercury compound.

1,159,383. **Electric Arc Lamp.** R. Holsten, assignor to Siemens-Schuckertwerke, G. M. B. H., Berlin, Germany. Arc maintained by combustible, fed between relatively movable electrodes, feeding of combustible and position of movable electrode automatically regulated.

1,159,409. **Electric Insulator.** A. R. Muller, Walthamstow, England. Series of petticoat insulators, each adapted to carry a wire, screwed together one above another.

1,159,418 and 1,159,419. **Projection Lantern.** J. T. Roffy, assignor to A K-Ray Corporation, New York, N. Y. Arrangements of lenses and reflectors.

1,159,451. **Trolley Harp.** C. Wetjen, New York, N. Y. Guard structure passing over wire yields to allow wire to pass in swinging trolley into and out of contact with wire.

1,159,456. **Electrical Connector.** E. B. Cox, Meriden, Conn. Plug has double pairs of contacts for making side and center contacts in screw socket or making both contacts at end.

1,159,467. **Automobile Horn.** P. C. Burns, assignor to American Electric Co., Chicago, Ill. Special structure having diaphragm vibrated by motor-driven toothed wheel.

1,159,484. **Street and Station Indicator.** H. A. Fleck and C. H. Fleck, Jr., Philadelphia, Pa. Sign belt on spring-driven rollers controlled by electromagnet.

1,159,492. **Focus Adjustment for Lamps.** L. T. Grandy, assignor to C. M. Hall Lamp Co., Detroit, Mich. Particular arrangement for adjusting lamp socket along axis of headlight reflector.

1,159,508. **Clock Movement.** J. Lemire, Drummondville, Que., Canada. Electromagnetic control of escapement.

1,159,511. **Arc-Lamp Electrode.** G. M. Little, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Contains titanium oxide and tungstic oxide.

1,159,519. **Floating Electric Trolleyway and a Floating Passenger Car.** S. C. Menier, San Francisco, Cal. Posts floating in upright position and anchored to sea bottom support trolley wire through which current is supplied to motor of floating car.

1,159,521. **Signal Switch.** B. Miller, German Valley, Ill. Particular structure of sliding circuit-closer operated by crank.

1,159,536. **Current-Collector for Electric Railways.** H. Schütte, assignor to Schütte Electric Co., Pittsburgh, Pa. Pneumatically operated collapsible frame supports trolley contact laterally adjustable independent of frame, provision being made for automatically maintaining contact pressure constant.

1,159,547. **Electric Switch.** G. A. Tate, Chicago, Ill. Circuit-breaker with tripping mechanism held in closed position by fuse.

1,159,554. **Pump.** C. J. Veley and L. S. Deal, assignors to Comstock Automatic Pump Co., Comstock, Mich. Water pumping system; driving motor and check valve operating magnet controlled by float switches.

1,159,562. **Switchboard Apparatus.** J. A. Wotton, assignor to Western Electric Co., New York, N. Y. Particular structure of strip of lamp sockets for telephone switchboard.

1,159,563. **Safety Device.** W. D. Baldwin and G. John, assignors to Otis Elevator Co., Jersey City, N. J. For elevators; electrical and mechanical automatically operable devices for setting the safety, the devices being operable independently, the electrical device controlled by a speed governor and the other device operating independently of the speed.

1,159,567. **Joint Insulator.** C. O. Burton, Duluth, Minn. Two separable, identical interlocking parts with recess to receive conductor joint.

1,159,578. **Safety Apparatus for Railways.** T. M. Freeble, Rochester, Pa. Particular arrangement of track circuits in block-signal system.

1,159,586. **Elevator-Door Lock.** J. D. Ihlder, assignor to Otis Elevator Co. Lock for latch controls circuit-closer and is controlled by passing car.

1,159,587. **Automatic Stop-Motion.** G. John and D. L. Lindquist, assignors to Otis Elevator Co. Limit-switch apparatus and manual controller for elevator combined on car.

1,159,590. **Dashpot Accelerating Device.** D. Larson, assignor to Otis Elevator Co. Electromagnetic switch with dashpot effective at beginning and end of movement.

1,159,595. **Telephone-Exchange System.** F. R. McBerty, assignor to Western Electric Co. Has key-controlled sequence switches for connecting operator's set with connecting circuits.

1,159,602. **Thermal Circuit-Closer.** J. F. Scheuer, Two Rivers, Wis. Rosette-like structure for securing to wall having circuit held open by fusible member.

1,159,603. **Telephonic Device.** H. E. Shreeve, assignor to Western Electric Co. Electromagnet acts on granular microphonic element to relieve pressure on granules upon tendency to pack.

1,159,612. **Controlling Apparatus.** A. Sundh, assignor to Otis Elevator Co. Nonreversing, alternating-current driving motor controlled, and transmission mechanism driven thereby controlled in both directions, by a master switch.

1,159,655. **Terminal Structure.** C. W. Davis, assignor to Standard Underground Cable Co., Pittsburgh, Pa. Vertically disposed structure mounted on cable end for connecting bridle wires. (See cut, next page.)

1,159,668. **Safety Device for Electric Switches.** F. C. Harris, Duluth, Minn. Nonconducting casing inclosing metal parts of switch, has slot through which handle projects and has provision for preventing accidental displacement of handle.

1,159,674. **Electric-Circuit Regulator.** G. Honold, assignor to firm of Robert Bosch, Stuttgart, Germany. Electromagnetically operated compression resistance device.

1,159,678. **Trolley-Wheel Guard.** W. L. James, West Homestead, Pa. Pull on rope removes guard fingers from above trolley wire and catch is provided on pole for holding them removed.

1,159,682. **Electric-Lamp Guard.** J. Kaufman, New Castle, Pa. Cage surrounding bulb has sliding rings to adjust the wires about bulb and spring members bearing against bulb to position it in cage.

1,159,699. Water-Purification Apparatus. J. A. Murdock, assignor of part to J. H. Hirst and C. A. Murdock, Los Angeles, Cal. Tubular, unitary structure comprising insulated electrodes for immersion in receptacle.

1,159,701. Plug-Socket. W. C. Neahr, assignor to Protective Signal Mfg. Co., Denver, Colo. Combined socket and cutout switch, insertion of the plug opening the switch.

1,159,704. Aerial Bomb. A. Parsons, Saranac Lake, N. Y. A bomb-carrier from which bomb may be released is suspended from aircraft and comprises a magnet operating a signal when attracted by iron vessel.

1,159,714. Electrical Selective Mechanism. A. H. F. Schaar, assignor of one-half to H. W. Bishop, Oakland, Cal. Single line, telegraphic selective system operated by arrangements of currents of different polarity.

1,159,723. Electric Safety System for Railroads. J. Skinderviken, Chicago, Ill., assignor of one-half to J. Gibbs. Electrical brakes on train controlled by devices spaced along track.

1,159,724. Train-Control System. S. G. Smith, Corpus Christi, Tex. Clock-controlled signal circuit on train is set in operation by track device to operate signal repeatedly and after certain number of signal operations train is automatically stopped.

1,159,730. System of Automatic Signaling for Electric Railways. F. Townsend, assignor to General Railway Signal Co., New York, N. Y. Block system has polyphase source, one phase actuating car, one phase impressed on track and relay operated by all phases, one of which is transmitted through trackway, at least two of phases being different from car-actuating phase.

1,159,752. Starter for Internal-Combustion Engines. F. E. Fisher, Detroit, Mich. Relates to gearing of electric machine and engine shaft.

1,159,765. Arc Lamp. C. Henrichsen, assignor to General Electric Co., Schenectady, N. Y. Particular circulatory ventilation system for inclosed flame arc.

1,159,769. Device for Indicating the Horsepower of an Engine. W. H. Hollstein, Lakewood, O. Pressure indicators vary rheostat, indicator being operated by the potential variations thus produced.

1,159,770. Coil Construction. R. M. Hyde, assignor to General Electric Co. Transformer windings built up of disk coils spaced apart by blocks built up of laminas. (See cut.)

1,159,793. Automobile Signal. J. C. Perry, Ocean Grove, N. J. Electromagnetically operated indicator controlled by push button on steering wheel.

1,159,798. Inulating Tube. A. B. Reynders, assignor to Westinghouse Eletric & Mfg. Co. Machine for forming tube by winding strip spirally.

1,159,800. Maximum-Demand Indicator. L. T. Robinson, assignor to General Electric Co. Indicating member moved by watt-hour meter and controlled by indicating wattmeter.

1,159,807. Trolley. F. Sczavnyicki, Bridgeport, Conn. Structural details of harp and spring-pressed guard fingers extending over trolley wire.

1,159,818. Electromagnetic Switch. J. J. Wood, assignor to General Electric Co. Particular structure having closing and holding-out gaps.

1,159,826. Machine for Counting Paper Money. J. P. Buckley, Washington, D. C. Bills passing singly between rollers interrupt circuit of counter.

1,159,853. Machine for Making Arbors for Incandescent Lamps. H. D. Madden, assignor to Westinghouse Lamp Co., Pittsburgh, Pa. Details of machine.

1,159,855. Special-Service Telephone System. T. G. Martin, assignor to Automatic Electric Co., Chicago, Ill. Automatic system; special service set bridged across line at central is disconnected by automatic switch operated in response to a call.

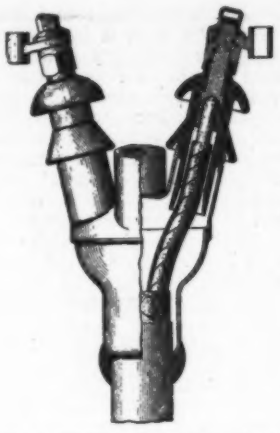
1,159,869. Vapor Electric Device. Y. Sakai, assignor to Westinghouse Electric & Mfg. Co. Mounting of terminal in casing wall.

1,159,884. Electrode-Cooling System. L. M. Aspinwall, assignor to Westinghouse Electric Mfg. Co. For rectifier; cooling fluid passed successively through cathode jacket and a number of hollow anodes.

1,159,892. Electrical Protective Device. H. W. Brown, assignor to Westinghouse Electric & Mfg. Co. Time-limit circuit-breaker controlled by resistors of different temperature gradients.

1,159,900. Vapor Electric Device. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Current rectifier; cooling fluid passed successively about casing and through anodes.

1,159,903. Electrode-Cooling System. D. C. Davis, assignor to Westinghouse Electric & Mfg. Co. Cooling stream passed successively through and its effect equalized at a number of anodes in rectifier.



No. 1,159,655.—Cable Terminal.

1,159,904. System of Electrical Distribution. H. P. Davis and F. Conrad, assignors to Westinghouse Electric & Mfg. Co. Feeder system for number of sectional trolley wires having circuit-breakers at section ends.

1,159,905. Fire-Alarm System. W. L. Denio, Rochester, N. Y. Has alarms at central and local stations which are operated simultaneously or the local alone.

1,159,908. Electric Gas-Lighter. R. F. Dowdy, Roanoke, Va. Igniting spark jumps to frame of gas device when electrode projecting from handle is brought near; handle has push button for closing circuit.

1,159,910. Cooling System. G. M. Eaton and S. W. Farnsworth, assignors to Westinghouse Electric & Mfg. Co. For rectifier; cathode and anode maintained at predetermined difference of temperature by regulating cooling fluid therefor.

1,159,911. Spark Plug. A. Eckhardt, Sutton, Neb. Central electrode bifurcated and each leg has a spark cap.

1,159,914. Starting Electrode for Vapor Electric Apparatus. S. W. Farnsworth, D. E. Carpenter and L. E. Frost, assignors to Westinghouse Electric & Mfg. Co. Adjustable mounting for electrode.

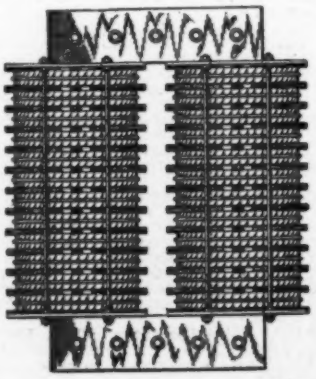
1,159,915. Starting Electrode for Vapor Electric Devices. S. W. Farnsworth and O. P. Schuster, assignors to Westinghouse Electric & Mfg. Co. Electrode is manually or electromagnetically adjustable.

1,159,916. Electrode Shield for Vapor Electric Apparatus. S. W. Farnsworth, D. E. Carpenter, L. E. Frost, D. H. Rose and E. F. Sipher, assignors to Westinghouse Electric & Mfg. Co. Details of structure for rectifier.

1,159,920. Trimming-Indicator for Arc Lamps. R. Fretzdorff, assignor to Korting & Mathiesen Aktiengesellschaft, Leutzsch, Germany. Indicator controlled by position of carbon holder.

1,159,922. Vapor Electric Device. L. E. Frost, assignor to Westinghouse Electric & Mfg. Co. Shield is placed about operating means, in the casing, for the movable electrode.

1,159,936. System of Electrical Distribution. F. W. Harris, assignor to Westinghouse Electric & Mfg. Co. Before overloaded feeder circuit is cut out, resistance is thrown in between generator and busbar.



No. 1,159,770.—Transformer Construction.

1,159,944. Vapor Electric Device. R. P. Jackson, assignor to Westinghouse Electric & Mfg. Co. Structure and arrangement of anode shield for rectifier.

1,159,947. Mechanism for Winding Insulated Electric Cables. G. A. Johnson, Newark, N. J. Arrangement of winding dies.

1,159,969. Detector for Wireless Telegraphy. C. O. Lorenz, Port Arthur, Tex. Comprises contacting bodies of chalcocite and zinkite.

1,159,994. Spark Plug. J. Rick, assignor to Triune Engineering Co., Newark, N. J. One of the sparking points is a loose ball carried in sparking chamber in end of casing.

1,160,013. Railway Signal. R. H. Todd, Philadelphia, Pa. Locomotive cab signal controlled by circuit through car wheel and track wire.

1,160,063. Electric Lamp Socket. F. P. Gates and G. A. Gauthier, assignors to Arrow Electric Co., Hartford, Conn. Key-operated lock for securing lamp in socket, key being disabled after locking is completed.

1,160,064. Key. F. P. Gates, assignor to Arrow Electric Co. Details of key for above.

1,160,072. Method of and Means for Translating Sounds. R. E. Hall, assignor of one-half to C. A. Robertson, Portland, Oreg. Vibratory diaphragm controlled by sound-varied air jet controls electric indicating circuit.

1,160,087. Dynamo-Electric Machine. A. H. Neuland, assignor to Neuland Electric Co., New York, N. Y. Inductor machine having toothed pole pieces and rotor arranged to simultaneously and similarly vary the flux through each pair of pole pieces.

1,160,092. Electrical Control System. W. Stull, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Electric railway operating on different voltage has devices insuring multiple connection of car lights on low voltage and series connection on high voltage.

1,160,094. Indirect-Lighting Fixture. H. C. Adam, St. Louis, Mo. Arrangement of reflectors, socket, supports, etc.

1,160,097. Telegraph Repeater. W. Finn, assignor to Western Union Telegraph Co., New York, N. Y. Special arrangement comprising polar repeating relays.

1,160,100. Method of Manufacturing Tubes. A. B. Reynders, assignor to Westinghouse Electric & Mfg. Co. Modification of No. 1,159,798.

1,160,101. Machine for Perforating Master Sheets for Typewriter Operators. L. E. Roberts, assignor to Underwood Typewriter Co., New York, N. Y. Electromagnetically operated, key-controlled perforators.

1,160,115. Time-Service-Controlled Mechanism. W. H. Thompson, assignor to United Development Corporation, Memphis, Tenn. Apparatus comprising driving motor circuit controlled by time, service and credit elements.

Reissue 14,007. Apparatus for Cleaning Articles. E. L. Couch, assignor to Couch-Dean Corporation, Hartford, Conn. Articles are carried on belt of electrolytically active material into chamber confining chemicals reacting with the electrolytically active material.

Patents Expired.

The following United States electrical patents expired on November 15, 1915:

614,076. Alternating-Current Motor and Mode of Operating Same. C. S. Bradley, Avon, N. Y.

614,082. Intermittent Electric Surface Conductor. F. Burger, Fort Wayne, Ind.

614,124. Electric Switch Mechanism for Electric Railways. J. M. Murphy, Torrington, Conn.

614,161. Electric-Car Truck. E. Clif, Newark, N. J.

614,190. Magnetic Chuck. O. S. Walker, Worcester, Mass.

614,207. Telephone-Exchange System. W. E. M. Jackson, Chicago, Ill.

614,225. Electric Meter. L. Gutmann, Peoria, Ill.

614,228. Method of Charging Secondary Batteries. C. O. Mailloux, New York, N. Y.

614,270. Insulated Supporter for Electric or Other Wires. C. K. King and G. A. Mead, Mansfield, O.

614,275. Apparatus for Heating and Agitating Air. E. F. Porter, Boston, Mass.

614,321. Trolley Controller. J. Dolan, Dayton, O.

614,373. Arrangement for Exciting Magnets of Dynamo Machines. M. Deri, Vienna, Austria-Hungary.

614,394. Starting Resistance for Alternating-Current Motors. E. L. K. F. Kahlenberg, Berlin, Germany.

614,404. Signaling Apparatus. M. Martin, Walden, Mass.

614,412. Electric Switch-Operating Mechanism for Railways. L. E. Watkins, Springfield, Mass.